THE VETERINARY RECORD

FOUNDED BY WILLIAM HUNTING, F.R.C.V.S., 1888

No. 4. JANUARY 24, 1953 VOL. 65.

THE EFFECT AGAINST *TRYPANOSOMA CONGOLENSE* IN ZEBU CATTLE OF THREE NEW PHENANTHRIDINE COMPOUNDS

BY

J. K. H. WILDE* AND J. ROBSON,

VETERINARY RESEARCH LABORATORY, MPWAPWA, TANGANYIKA TERRITORY

Watkins & Woolfe (1952) have described preliminary tests on the trypanocidal effect of certain new compounds produced by substituting for the quaternising group of dimidium bromide, other radicles. In dimidium bromide, which has proved of such value as a trypanocide, the quaternising group is $-CH_3$. The three compounds used in the experiment described here were prepared by the substitution of $-C_2H_5$; $-C_3H_7$; and $-CH_2\text{-}CH\text{-}CH_2$ and were designated R.D. 1572, R.D. 1427, R.D. 1446 respectively. About 10 grammes of each were provided by Messrs. Boots Pure Drug Co. Ltd., for the experiment. The results obtained by Watkins & Woolfe (*loc. cit.*) indicated that these compounds had a greater trypanocidal activity against *T. congolense* than had dimidium bromide while showing a lower toxicity. An experiment was therefore planned to determine the trypanocidal effect of these new drugs against *T. congolense* in Zebu cattle, at the same time attempting to obtain a comparison with the effect of dimidium bromide.

DETAILS OF THE EXPERIMENT

Ninety-three Zebu cattle with histories of no previous infection with trypanosomes were infected with *T. congolense*. The strain used was collected from a naturally infected bovine at a place in the Central Province of Tanganyika called Kimagai. The infective blood was first inoculated into goats and the experimental cattle were infected by inoculation of 2 c.c. of heavily infected goat blood. All the cattle showed trypanosomes in their peripheral circulation by the seventh day. The cattle, which were of mixed size and sex, were all under four years old. They were divided into groups, every care being taken to ensure a reasonably uniform distribution according to sex and size. Nine groups of eight animals each were used for treatment with the new drugs. Two groups of six each were used for treatment with dimidium bromide and nine animals were left untreated as controls.

The three new drugs were dark orange red in colour and dissolved readily to produce red coloured solutions. The solubilities varied, the most soluble being so to the extent of 3·5 per cent. (R.D. 1572), but all could be made up to 1 per cent. solutions easily. The solutions were boiled before use and remained stable even on prolonged boiling. In each case the drug, whether one of the new series or dimidium bromide, was used in 1 per cent. solution and was injected subcutaneously behind the shoulder. The new drugs were administered at three dosage levels, *viz.*, 0·1, 0·3 and 0·9 mg. per kg., and dimidium bromide was administered at two dosage levels, *viz.*, 0·5 and 1·0 mg. per kg.

All the animals were weighed before infection, at the time of treatment and at monthly intervals throughout the experiment. Haemoglobin estimations were made by means of the Dare haemoglobinometer before infection, immediately before treatment and at one month and two months after treatment. Thick blood smears were examined for trypanosomes at weekly intervals. The groups were run together as one herd and kept on grazings free from tsetse flies. As a safeguard against mechanical transmission, insecticidal sprays were applied to the animals frequently. Observations were recorded for a period of six months after treatment.

From each treated group except that receiving dimidium bromide at the rate of 0·5 mg. per kg., two animals were selected for more detailed examination for the disappearance of trypanosomes from the peripheral circulation immediately after treatment. Thick smears from these animals were examined at two hourly intervals until all trypanosomes had disappeared from the blood. The results of this test are shown in Table I.

For purposes of assessment of the results of the main experiment, an animal was considered to have relapsed if trypanosomes reappeared in the peripheral circulation and persisted for two or more consecutive weeks. Absence of trypanosomes combined with maintenance of general health as observed clinically for six months following treatment was considered to represent a complete cure. On five occasions a single trypanosome was seen in a blood slide without any further evidence of trypanosomes being found subsequently. These cases were not considered as relapses. The results are shown in Tables II and III (overleaf).

TABLE I

Drug	Dosage in mg. per kg. bodyweight	Interval in hours between treatment and disappearance of trypanosomes (Average for two animals)
R.D. 1427	0·1	52
	0·3	44
	0·9	44
R.D. 1446	0·1	60
	0·3	40
	0·9	40
R.D. 1572	0·1	84
	0·3	48
	0·9	32
Dimidium bromide	1·0	52

Table III is derived from an examination of the records of weights of the animals from the time of treatment to the termination of the experiment and of the record of haemoglobin estimations for two months from the time of treatment. The experiment was initiated in March, 1951, and ran through to September. Thus, no supplementary feeding being given, a large weight increase could not be expected as the period of the experiment included almost an entire dry season, the grazing being coarse and scanty.

* Present address: Veterinary Research Laboratory, Vom, N. Nigeria.

TABLE II

Group	Drug	Dosage in mg. per kg.	Number treated	Relapses	Intervals in weeks after treatment when relapses occurred										
					2	3	4	5	6	7	8	9	10	12	16
1	R.D. 1427	0·9	8	1											1
2	,,	0·3	8	2*										2	
3	,,	0·1	8	7	1	3			2						1
4	R.D. 1446	0·9	8	4			1	2						1	
5	,,	0·3	8	7					3		1	2		1	
6	,,	0·1	8	8	1	2	2	2	1						
7	R.D. 1572	0·9	8	1											1 n.b.
8	,,	0·3	8	1						1					
9	,,	0·1	8	4				1	1	1					1
10	Dimidium bromide	1·0	6	1									1		
11	,,	0·5	6	4		2				2					
12	Nil	—	9	9†	9										

* One other animal from this group died from other causes and showed no signs of trypanosomes.
† Three of the controls died and the remainder received treatment and recovered.
n.b. This relapse was noticed only recently, when all the data and records of the experiment were re-examined. It had not been noted when Watkins & Woolfe (1952) published a preliminary report of their own tests and of this experiment.

TABLE III

Group	Drug	Dosage	Weights: Number of animals showing			Haemoglobin in grammes per 100 c.c. Control for group.	
			Increase	Decrease	Inappreciable change	Increase	Decrease
1	R.D. 1427	0·9	6	—	2	1·75	—
2	,,	0·3	6	—	2	2·9	—
3	,,	0·1	5	3	—	0·4	—
4	R.D. 1446	0·9	4	3	1	1·1	—
5	,,	0·3	6	—	2	—	0·3
6	,,	0·1	4	4	—	0·15	—
7	R.D. 1572	0·9	4	2	2	1·3	—
8	,,	0·3	8	—	—	2·0	—
9	,,	0·1	3	4	1	1·0	—
10	Dimidium bromide	1·0	4	—	2	0·6	—
11	,,	0·5	5	1	—	1·1	—
12	Nil	—	—	9	—	—	0·2

TABLE IV

Group	Drug	Dosage	Nature of local reaction					
			L.P.	L.F.	M.F.	S.	S.L.	Nil
1	R.D. 1427	0·9	4	—	2	1	1	—
2	,,	0·3	1	—	1	2	3	1
3	,,	0·1	—	—	—	3	2	3
4	R.D. 1446	0·9	2	—	3	1	2	—
5	,,	0·3	—	—	2	3	3	—
6	,,	0·1	—	—	—	3	4	1
7	R.D. 1572	0·9	2	1	1	3	—	1
8	,,	0·3	1	1	1	3	2	—
9	,,	0·1	—	—	—	6	—	2
10	Dimidium bromide	1·0	—	1	1	2	1	1
11	,,	0·5	—	—	2	2	1	1

L = Large
F = Flat plaque
S = Small lesion
P = Pendulous
M = Medium sized lesion
S.L. = Slight or very slight lesion

It is noted in Table II that in certain cases relapses occurred several weeks after treatment. It is possible, in spite of measures to control flies, that these represent infection by mechanical transmission through the agency of biting flies, earlier relapses and untreated controls acting as the reservoir.

As all injections were of solutions of 1 per cent. strength, the volumes of fluid injection varied from those given at 0·9 mg. per kg. to large animals (in the region of 24 c.c.) to those given at 0·1 mg. per kg. to small animals (in the region of 2 c.c.). The largest dose given was 27·5 c.c. and the smallest 1·2 c.c. It was therefore difficult to ensure accuracy of dosage at the low dosage levels.

The local reactions observed were mild, varying from a fairly large pendulous oedematous swelling to a very slight thickening of subcutaneous connective tissue. The largest swellings were produced in those animals which received the drugs at the level of 0·9 mg. per kg. This may be due to the larger bulk of fluid injected.

Their distribution and degree are shown in Table IV.

DISCUSSION

From the data obtained it is possible to conclude with confidence that of the three new drugs tested, R.D. 1572 was definitely the best trypanocide, and that R.D. 1446, although showing trypanocidal properties, did not demonstrate these to an extent sufficient to justify its consideration in comparison with dimidium bromide. R.D. 1427 fell in between the other two in its trypanocidal propensities which appeared to be of a similar order to those of dimidium bromide. R.D. 1572 compared very favourably with the latter drug. The relapse rate when R.D. 1572 was used at the levels 0·9 and 0·3 mg. per kg. was slightly less than when dimidium bromide was used at 1·0 mg. per kg. and considerably less than when the latter drug was used at 0·5 mg. per kg.

No toxicity trials were attempted, but on examination of Table III the weight variations and haemoglobin figures

indicate that R.D. 1572 is no more toxic at a dosage of 0·9 mg. per kg. than dimidium bromide at a dosage of 1·0 mg. per kg. and may be interpreted as indicating that the new drug is less toxic at these levels. An outstanding feature of R.D. 1572 and to a lesser extent of R.D. 1427 is that cure was effected in a few cases by doses of 0·1 mg. per kg. With R.D. 1572, only one relapse out of eight occurred when the drug was used at a level of 0·3 mg. per kg. It is justifiable to assume from this that the limits between minimum therapeutic dose and maximum tolerated dose for R.D. 1572 are set wide apart. This confirms the observations of Woolfe (1951) on acute toxicities for mice.

Conclusions

It appears that R.D. 1572 and to a lesser extent R.D. 1427 are better trypanocides against *T. congolense* in the Zebu bovine than is dimidium bromide and that R.D. 1572 merits development as a field drug.

Summary

1. Three new drugs prepared by alteration of the quaternising group of dimidium bromide were obtained for experiment.

2. Details of the experiment, in which 93 Zebu cattle were used and in which the pathogen was *T. congolense*, are described.

3. The results of a disappearance test and the therapeutic tests on the drugs are tabulated.

4. The significance of the results is discussed.

5. It is concluded that two of the drugs are good trypanocides and one of them, R.D. 1572, is well worthy of further development as a field drug. R.D. 1572 has now been given the trivial name of ethidium bromide.

Acknowledgments.—The kind co-operation of Mr. D. L. Hughes, F.R.C.V.S., DIP. BACT. (LOND.), and Dr. G. Woolfe, representing Messrs. Boots Pure Co. Ltd., is gratefully acknowledged and the Director of Veterinary Services, Tanganyika Territory, is thanked for the facilities provided for this work and for permission to publish the results.

References

Watkins, T. I., & Woolfe, G. (1952). *Nature.* **169.** 506.
Woolfe, G. (1951). Personal communication.

PONY BREEDERS' CONGRESS

The second world conference of the International Pony Breeders' Federation will meet at Edinburgh from February 23rd to 28th. The federation was formed following a congress held at Cologne from a proposal by Mr. Gunnar Bjarnason, of Iceland. His original suggestion was followed up by Mr. Thies, President of the Southern German Pony Stud Book, and Professor Mitchell, of the Royal (Dick) Veterinary College, was elected the first President. The objects of the congress include bringing together pony breeders from all countries so that they may exchange ideas and discuss matters of common interest, to further pony breeding, the use of ponies in agriculture, industry and sport, and to preserve and protect native pony breeds.

The programme which has been planned varies from the scientific to the practical. There will be papers on native and foreign breeds, scientific studies, film shows of ponies at work and play, visits to pony herds in the neighbourhood of Edinburgh, and practical demonstrations of ponies and equipment in the covered riding school at Redford Barracks.

After the congress it is hoped that overseas visitors will be able to visit other parts of the British Isles to see our native breed herds in their natural surroundings. It is intended to invite each of the nine British Pony Societies to arrange for ponies to be present in Edinburgh throughout the congress.

THE EFFECT OF VARIOUS FORMS OF FLUID REPLACEMENT DURING CIRCULATORY IMBALANCE IN THE DOG

BY

A. M. HARTHOORN, D.V.SC., M.R.C.V.S.,

Orpington, Kent

(*Continued from page 40*)

PART II

The Effect on the Blood Pressure and Circulatory Plasma Volume of the Infusion of Isotonic Solutions of Pure Heterologous (Bovine) Albumin Solution, Compared to that of Homologous and Heterologous Plasma

Introduction

In my paper published in your issue of last week* the effect was described of the intravenous infusion of gelatine solution, normal saline solution and protein hydrolysate into animals (dogs) suffering from a condition of post-operative (surgical) shock. The result of the infusions on the blood pressure and circulating blood and plasma volumes was related, as well as their effect on subsidiary symptoms such as the haematocrit value, the total plasma protein percentage, and the central oxygen and carbon-dioxide content of the blood, where applicable. Homologous plasma infusion was used as a standard both to compare the efficiency of the substances used as well as to ensure the reversibility of the shock that was being treated. The various cases of shock on which trials of blood substitutes were being made were of the same degree. This was ensured by means of extensive observations during a fixed period of hypotension, including the repeated measurement of the blood and plasma volume, total plasma protein percentage, etc.

The trials on the effect of isotonic albumin solution were conducted under circumstances identical with those of the above-mentioned artificial blood substitutes.

Preliminary Investigations

In the early part of these investigations, when the failure of the artificial blood substitutes in the therapy of shock was becoming evident, trials were made with the use of heterologous plasma as infusion material to restore the effective blood volume. This heterologous plasma was prepared from the blood of the bovine animal. Blood was withdrawn under aseptic conditions by puncture of the jugular vein of healthy cattle. The material used for the collection was autoclaved after repeated washings with pyrogen-free water. Sodium citrate was used as the anti-coagulant.

Immediately after collection the blood was centrifuged, and the supernatant plasma collected by negative pressure. It was preserved by immediate freezing as suggested by Strumia & McGraw (1941).

A detailed report on the result of the infusion of heterologous plasma would be out of place in this paper, and has been given elsewhere.† The general result, however, was as follows: In the majority of cases of infusion of heterologous plasma, the result as judged mainly from the

* *Vet. Rec.* **65.** 35-40.
† Harthoorn, A. M. (1951). Unpublished report.

blood pressure appeared to be at least as good as, and in some cases rather more rapid than, that due to the infusion of the homologous product. (See Fig. 2.) Possible reasons for this latter phenomenon were discussed, and it was assumed that the principal cause was that whereas in the homologous blood there was in most samples evidence of visible haemolysis due to the fragility of the canine red blood cell, this liberation of haemoglobin was not evident in the plasma obtained from bovine sources. The samples of dog blood were pooled to provide sufficient quantity for practical use so that some free haemoglobin would have been present in the plasma used in every infusion.

The various reports on the harmful substances which are liberated from the ruptured red blood cell (Buttle *et al.*, 1940 ; Strumia *et al.*, 1940 ; Scudder, 1940) and which are probably in the nature of adenosine, adenylic acid, and adenosine-triple-phosphate (Barsum & Gaddum, 1935 ; Zipf, 1931) tend to have deleterious effects such as bradycardia, with impaired cardiac conduction, as well as peripheral vasodilatation (Drury & Szent-Györgi, 1929 ; Binnet & Drury, 1931).

In spite of the overall good results pertaining to the infusion of heterologous plasma as a blood substitute, reactions to the foreign protein thus introduced occurred in about 10 per cent. of cases. This reaction was characterised by hyperpnoea, and a delay in the rise of the blood pressure from shock level. The results indicate that the chances of survival of the animals exhibiting this protein reaction were not adversely affected.

Trials made with the separate fractions of the heterologous plasma on the blood pressure of normal animals indicated that this reaction might be ascribed to the globulin fraction of the plasma.

Other reactions of a lesser nature were noted. The injection of heterologous plasma into an animal with normal blood pressure would result in a marked depression of the blood pressure about an hour later (see Fig. 1). Subsequent injections would no longer elicit this result.

If pure albumin solution was injected, a very slight depression in the blood pressure followed. Subsequent injections of albumin also produced no further result, even if they were from other batches of albumin. An injection of heterologous plasma at this juncture would result in the depression of the blood pressure occurring in full measure.

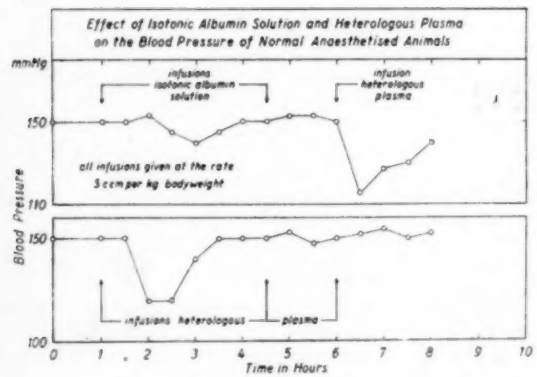

Effect of Isotonic Albumin Solution and Heterologous Plasma on the Blood Pressure of Normal Anaesthetised Animals
mm/Hg
infusions isotonic albumin solution
infusion heterologous plasma
150
all infusions given at the rate 5 c.cm per kg. bodyweight
110
Blood Pressure
150
infusions heterologous
plasma
100
0 1 2 3 4 5 6 7 8 9 10
Time in Hours

FIG. 1

This again would suggest that the depression in the blood pressure was due almost entirely to the globulin fraction.*

* It is remarkable that in the cases where heterologous plasma was injected during hypotension and shock, no deflection in the rise of the blood pressure could be detected to mark the occurrence of this depression.

All these disadvantages pertaining to the use of heterologous plasma were surmounted when the plasma was completely divested of its globulin content. At the same time the plasma (albumin) retained its full power of resuscitation.

ALBUMIN AND PLASMA

The use of albumin in the practice of human surgery has little to recommend it over concentrated plasma, because, if it is desired to raise the oncotic pressure of the blood for therapeutic reasons, the addition of globulin together with the albumin has no apparent disadvantage, and the whole dried plasma can be used. So we read reports by Hughes, Mudd & Streker (1936) on the use of concentrated lyophil serum for the purpose of lowering intracranial pressure; Aldrich, Stokes and others (1938) on the use of concentrated serum for nephrosis; Thompson, Ravdin and others (1938) on its use for the prevention of disruption of wounds in chronic hypoproteinaemia. The use of human albumin however, was suggested by Cope in 1944 on the grounds that it was largely albumin that escaped from the blood stream in burns and shock. He stated that the best solution to inject into the blood stream to replace that which had been lost was one that was chemically identical to it, and suggested a mixture of equal parts of human plasma and saline and adding enough dried albumin to raise the concentration to 4 grammes per cent.

In veterinary practice, however, homologous plasma is virtualiy non-existent. A search was made for a blood substitute that was free from the disadvantages associated with the usual products, while being efficient in restoring the circulation and preserving the life of the animal in conditions of hypotension and shock. It was hoped, originally, that gelatine would fulfil this rôle, because of its similarity to the body proteins and the fact that it can be metabolised and so does not accumulate in the body. Therefore it would not present the grave disadvantages which preclude the use of many of the blood substitutes, such as pectin solutions, that are completely foreign to the body tissues. The results obtained from the use of gelatine in these experiments were disappointing.

Although it was found that bovine plasma would restore the blood pressure where other blood substitutes failed to do so, and was instrumental in saving the life of the animal in a state of shock, it had several grave disadvantages associated with the globulin fraction, not the least of which was that globulin is extremely antigenic (Cohn, 1941; Kremen and others, 1940). Furthermore, as heterologous globulin is of little use to the animal, its removal from plasma would have the advantages that

(*a*) The quantity of protein that must be injected to obtain a therapeutic rise in the blood pressure would be smaller (Scatchard *et al.* (1944) showed that 0·8 gramme of albumin has the same osmotic pressure effect as 1 gramme of total plasma protein) and its administration not associated with the injection of an excessive volume (Heyl and others, 1943).

(*b*) The viscosity of concentrated plasma is far greater than that of concentrated albumin, on account of the presence of the globulin fractions (Cohn, 1941; Cohn, Oncley *et al.*, 1942).

(*c*) Albumin has a far greater solubility and stability in solution (Cohn, 1941) and is far less easily denatured by adverse conditions (Scatchard, Gibson *et al.*, 1944). The low viscosity of the albumin solution has a special advantage, in that it enables solutions of high concentration to be injected through fine intra-

venous needles, if necessary by gravity, while the greater solubility of albumin makes the preparation of a solution from an ampule of the dried substance a practical proposition under field conditions.

Another advantage presented by the dried albumin over the use of whole plasma is that much smaller quantities of fluid need be injected. Apart from the advantages associated with the ease of administration, we have also found that considerable therapeutic benefits accrue from the administration of small quantities of concentrated solution (Harthoorn, 1952) in that the chances of recovery of the animal are greater when small quantities are injected than when the vascular bed is distended by the infusion of large amounts.

The use of homologous plasma albumin in human surgery has an advantage over whole plasma, associated with the destruction of certain pathological agents by the process of the separation of the other plasma fractions. The application of this to veterinary medicine cannot be predicted accurately. Parry & Larin (1951) warn against the danger of transmitting virus hepatitis in dogs through the use of infected blood donors and serum producers, and the risk of infecting the recipient with homologous serum jaundice has always been a grave deterrent to the use of human whole plasma. The report of Janeway, Gibson, Woodruff *et al.* (1944) has shown, in respect of the latter, that this does not occur with the administration of the albumin fraction alone, and their report was confirmed by the Report of the Council of Pharmacy and Chemistry in 1947 and 1948. The risk of untoward reactions due to the transmission of pathological agents is therefore likely to be lessened.

The Fate of Albumin in the Body

There does not seem to be complete agreement as to the exact metabolism of albumin which has been introduced into the blood stream by intravenous injection, but the preponderance of experimental results suggests that it is directly utilised by the body. Published reports on this subject are few and these are concerned with the utilisation of albumin in the human subject. Although no deductions can be made from them as to the fate of similar injections in the animal, they do give an indication as to whether we might expect the injected albumin to be broken down and utilised or treated as a foreign body. The quantities which are given in the treatment of shock are too small to offer much in the way of protein supplement to the tissues; such supplements are better and more cheaply supplied by other products, such as digests of protein which may be given after the circulation has been re-established. Our main concern is whether we are not injecting a substance which, like so many of the artificial blood substitutes, localises in the tissues and either disturbs the function of some essential organ such as the liver or causes irretrievable damage to the vascular system, as reported from the use of gum acacia by Dick, Warweg & Andersen (1935), Studdiford (1937), Yuile & Knutti (1939) and Heuper (1942); from pectin solutions by Small, Edwin & Palmer (1951), Popper, Volk *et al.* (1945) and Heuper (1942); from polyvinal alcohol by Heuper *et al.* (1942), Heuper, Landberg & Eskeridge (1940), and from dextran by Turner, Butler, Smith & Scudder (1949).

Studies on the injection of homologous albumin in man by Eckhardt, Lewis and others (1948) have shown that apparently it is utilised by the body. They maintained the nitrogen balance in patients when 37·5 grammes were injected daily by the intravenous route, although no less than 50 grammes were necessary when it was given by mouth. Brand, Kassell and others (1944) and Hegsted and others (1945) have shown that it appears to be broken down and utilised by the body, and that the reason for failure to maintain positive balance is only that it is deficient in some essential amino acids, namely, tryptophane and isoleucine. Thus its utilisation may be enhanced by the addition of these substances. A positive nitrogen balance was also obtained by Waterhouse, Basset & Holler in 1949 in a number of patients given intravenous injections of 60 grammes of human serum albumin daily. Although positive nitrogen balances could be maintained for as long as 10 days, grave side reactions were observed, due apparently to the great increase in the osmotic pressure of the blood. This resulted in haemorrhages such as epistaxis, while proteinuria was apt to develop when the system became saturated with albumin.

In 1944 Janeway, Gibson & Woodruff reported striking improvements in the nutritional state of hypoproteinaemic patients who were given injections of homologous albumin solutions. They conclude that the only limitation of this type of therapy is the failure of the patients to adjust themselves to the increased plasma volume.

Experiments on the possibility of preserving the nitrogen balance by injections of heterologous albumin do not seem to have been attempted, although Davis & Eaton (1942) with Williamson (1942) indicate that it seems to be *utilised* when injected into the human subject. The fact that bovine albumin differs from human albumin only in the spatial relationship of its groups makes its rejection by the body unlikely (Taylor & Keys, 1942), while its protein nature will prevent its localisation in the body for any period of time. The likelihood of liver damage from its administration to man has been discounted by the control tests of Taylor, Keys & Savage (1942). See below.

Reports on the Use of Homologous Albumin

Interest in the possibilities of the use of the albumin fraction alone as a therapeutic agent has been relegated to second place on account of the availability in human practice of concentrated whole plasma, of which large quantities are produced annually in the lyophil form. Interest was revived, however, about 1943-44, on account of the preparation of gamma globulins from human plasma, which when concentrated about 25 times were proved to be valuable therapeutic agents against such conditions as mumps and diphtheria (Enders, 1944) and in the prophylaxis and treatment of measles (Stokes, Maris & Gellis, 1944), while a report on the same subject was issued by Ordman, Jennings & Janeway in the same year. A stable and active haemoglutinating fraction was also prepared from the fractionation of human plasma by Pillener and others (1944). A large number of reports was then issued on the treatment of various pathological conditions in man with concentrated human serum albumin, especially of those conditions in which one of the clinical symptoms was oedema.

Thus we read a report by Luetscher in 1944, indicating that diuresis resulted from an increased plasma volume, due to the withdrawal of the oedema fluid from the interstitial spaces by the homologous albumin introduced intravenously; while an increased diuresis, due to the same condition, was also evoked by Gargill using albumin in 1948. Increments of the plasma volume of up to 30 per cent. were observed, while the plasma osmotic pressure increased

up to 20 per cent. following a single injection, not returning to normal for 48 hours. Similar results were obtained from the administration of human serum albumin for the same condition by Thorn, Armstrong, Dickerson and others.

Human serum albumin was used successfully in the treatment of shock in six negroes by Warren, Stead and others in 1944. In five of these the shock was from haemorrhage and the sixth from burns. The blood pressure was registered from the femoral artery. The injection of concentrated albumin produced in every case a marked rise in the arterial pressure and an improvement in the clinical condition. Their results were confirmed in the same year by Cournand, Noble, Breed, Lauson *et al.*, who reported that human albumin solution produced a larger rise in the plasma volume than did saline solution in 12 clinical cases of body injuries in hospital patients. Although in none of these cases was the effect of the albumin compared to that of plasma, there was no indication from the results that the response to the latter could have been better than it was to homologous albumin solutions.

Human serum albumin has also been used in other conditions of hypoalbuminaemia such as ascites, and reports were published on the results of this therapy by Janeway, Gibson, Woodruff *et al.* (1944); Kunkel, Labby and others (1948); Thorn, Armstrong & Davenport (1946) as well as by Patek, Mankin and others in 1948. Several successes in the treatment of ascites were also claimed by Faloon and others (1949), while the use of the same plasma fraction in the treatment of other forms of oedema, associated with hypoproteinaemia, was reported by Armstrong in 1947. In all these conditions, including the nephrotic syndrome, the treatment by intravenous administration of homologous serum albumin was symptomatic in so far as it did not eliminate the root of the condition and therefore did not usually result in a permanent cure. In this respect the treatment with albumin solution differs from the institution of albumin therapy in shock, in that it is not only symptomatic, but in most cases also prevents further loss of fluid by supplying the colloid fraction, the initial loss of which set off the train of symptoms leading to the shock process.

In many other cases, where the initiating factor is treated or removed surgically, the re-establishment of an adequate colloid fraction of the blood to enable it to absorb and maintain electrolyte solution is needed to complete the restoration of a normal circulation and thus to allow the physiological recuperative powers of the organism to effect complete recovery.

Heterologous Albumin

Bovine albumin was chosen for the purpose of these investigations, first because bovine plasma originally had been used for the comparison of heterologous with homologous plasma, and further because bovine blood was more readily available than that of other species. No reason can be suggested, however, why the albumin of other species of animal should not have the same therapeutic effect, provided that it can be prepared as a pure product, free from contamination, and free from traces of the globulin fraction.

The use of pure albumin solution has been made possible by the researches of Cohn and co-workers (1939-1944), who were able to prepare highly purified fractions of the plasma of the human subject, horse and ox. These fractions have been shown by electrophoretic technique to be of a high degree of purity, although at the time it was shown that the albumin fraction contains also a slower moving component, which, according to Taylor and Keys (1940), may not be entirely albumin.* The latter authors also state that the antigenic properties of some of these preparations of albumin may be due to residual globulin. Globulin to the extent of 1 per cent. was also shown by electrophoretic and ultracentrifugal studies to be present in 113 samples of human albumin, obtained from different laboratories in 1944 by Williams, Peterman, Colovos and associates.

Reports on the Injection of Heterologous Albumin

Clinical trials were made on man with the intravenous injection of bovine serum albumin before the time when larger quantities of human serum albumin became available. It was compared with human serum albumin treatment of acute blood loss by Heyl, Gibson & Janeway in 1943; and on patients with normal blood pressures by Taylor, Keys & Savage (1942). The first-mentioned authors found that in normal subjects the injection of both bovine and human albumin after venesection was followed by rapid haemodilution so that the blood volume, as measured by the haematocrit value, was almost back to normal in 15 minutes. The amount of blood removed was 10 to 20 per cent. of the total blood volume.

The after effects of the administration of bovine albumin were reported as excellent. No abnormal physical effects were discovered in any of the experimental subjects. Urine analysis by ordinary methods failed to show proteinuria after injection. The above-mentioned authors also point out that *liver damage was excluded, as ascertained from determination of serum protein values over a period of three to four months.* These determinations showed no difference in the albumin/globulin ratios, such as would have been expected had liver damage occurred from the injection of either homologous or heterologous protein in such high concentrations (Whipple, 1941; Madden & Whipple, 1940). The bovine albumin took *several months* to disappear completely from the blood stream.

Taylor *et al.* (1942) report much the same results as a consequence of the administration of bovine albumin to human patients with normal blood pressures. Few adverse reactions were noticed; according to these authors most of these could be put down to the failure to eliminate contamination with resulting pyrogen formation. Complete control of sterility was achieved only when alcohol was used for the separation instead of ammonium sulphate, and the former is recommended on these grounds. No significant changes were noticed in the blood pressure when solutions containing 0·5 gramme of bovine albumin per kg. bodyweight were administered to normal animals. These workers also maintain that the slight antigenic properties which they observed on the repeated injection of their albumin to human patients were due solely to contaminating globulin.

Reports on the use of bovine albumin in animals and in man were also made by Janeway & Beeson (1942) at the annual meeting of the American Society for Clinical

* This fraction could not be demonstrated by electrophoretic studies of the bovine albumin prepared by the laboratories of the Blood Transfusion Service of the Netherlands Red Cross, Amsterdam, who kindly provided the greater part of the albumin used in these experiments.

Investigations. They stated that interest in the use of albumin had been stimulated because its properties of low viscosity, great stability, solubility and osmotic activity, render it theoretically an ideal substance for increasing and maintaining the blood volume. Injections of albumin prepared by salting out and dialysing in cellophane were made on 18 human subjects without untoward reaction, except for serum disease in one subject, who had previously suffered from serum disease from horse serum. Failure to prepare completely pure fractions, it was stated, was indicated by the finding that a slight cross immunological relationship could be detected between anti-albumin sera and ordinary therapeutic horse sera. They were found to decrease, however, with increasing purity of the albumin fraction.

Tests on dogs by the intravenous administration of bovine albumin were reported by Davis & Eaton (1942a,b). They found that the administration of serum globulin alone produced toxic effects and sickness. The poor results obtained by the administration of globulin alone were confirmed in 1943 by Mylon and others, who, although they used homologous globulin and perhaps for that reason did not report the sickness symptoms reported by the former authors, found that its action on injection was of no benefit, and that it was inferior to that of saline alone in causing a rise in the blood pressure.

Further trials with the injection of bovine serum albumin in the human subject were made by Davis, Eaton & Williamson in 1942. The results obtained were very similar to those of Janeway & Beeson in the previous year. Previous injection into mice at the high proportion of 1 c.c. of a 5 per cent. solution per 15 grammes body-weight revealed a complete absence of toxic effects. The injection at rates of 50 to 300 c.c. into human subjects varying from 15 to 65 years of age caused no fall in the blood pressure and produced no evidence of a foreign protein reaction. Rigors and elevations of temperature did not occur, neither was albuminuria noticed in any of the patients. *They add that "absence of albuminuria following transfusions indicated that bovine serum albumin is utilised by the human being."*

Procedure.—The albumin originally used in the investigations was prepared by the fractionation of bovine plasma, using ammonium sulphate at the concentrations suggested by Cohn & McMeekan and others in 1939 and 1940. The salt was adjusted to the concentration of 2·05 moles per litre which, according to the above authors, precipitates the various globulin fractions including the fibrin, while both the crystallin albumin as well as other fractions such as the haemocuprin and glycoproteins remain in solution. The globulin fraction was removed by centrifugation, while the albumin, after precipitation by increased concentrations of ammonium sulphate, was removed by filtration in a Buchner funnel. It was then redissolved in saline and dialysed at room temperature against running water, until all but minute traces of the ammonium sulphate had been removed. The pure albumin solution was then rapidly frozen to the solid state, and concentrated by repeated freezing and thawing as in the method suggested by Entopol *et al.* (1948). Sodium chloride was added to a physiological level. It was preserved in the frozen state until required for use, when, after thawing, it would be diluted to the required strength by the simple expedient of adding 0·9 per cent. saline solution.

The albumin solution was considered as being isotonic with plasma at a concentration of 5 per cent. This is not high in view of the usual percentage of albumin found in plasma and if the oncotic pressure of the globulin is also taken into consideration. Scatchard and others (1944) have determined that 0·8 gramme of albumin is equivalent in its oncotic properties to 1 gramme of plasma protein. This places the percentage of albumin to be used as an isotonic solution at slightly over 5 per cent. at normal plasma protein ranges (Gorter & de Graaf, 1947); 5 per cent. was also indicated as the percentage at which albumin is isotonic by Heyl, Gibson & Janeway (1943).

Although gratifying results were obtained with this preparation, it had the disadvantage that it was not possible to gauge the extent of the possible bacterial contamination during the process of filtration and especially dialysation, with consequent pyrogen formation. Later work was performed with albumin which had been prepared by equilibration of the solution across membranes with ethanol at a temperature of -5° C. as suggested by Cohn and others (1940). This not only effectively prevented bacterial growth during the process of fractionation, both by the temperature necessary to prevent the denaturation of the product and by the antiseptic action of the ethanol, but in addition obviated the process of dialysation, the alcohol evaporating when the product was dried to a lyophil form by the process of Flosdorf & Mudd (1940). All the antigenicity tests were performed with the albumin prepared in this manner.

The latter pure bovine albumin, which is prepared in considerable quantities by the laboratories of the Blood Transfusion Service of the Netherlands Red Cross, and of which amounts are exported to England, is used for the purpose of Rh. testing in human blood transfusion work. It is retailed in small screw-capped bottles containing quantities of the dried albumin to make 25 or 50 c.c. of a 20 per cent. solution. Being in the dried form, the albumin packed in this way can be preserved at room temperature for an indefinite period and will readily dissolve to form a clear solution which shows no tendency to settle if allowed to stand for a period of several weeks. Most of the experimental results reported in this paper were carried out with albumin prepared in this manner, and kindly supplied by the Netherlands Red Cross.

The Effect of the Infusion of Albumin Solution as Compared to that of Plasma Infusion

If the average increments of the blood pressure curves, obtained from the infusion of homologous and heterologous plasma and bovine albumin into animals suffering from a state of shock, are plotted, it will be seen (see Fig. 2, overleaf) that the integration of the blood pressure curves produced by the injection of isotonic albumin is slightly better than that due to either canine or bovine plasma.

The reason for the superiority shown in this respect over the homologous blood fraction has already been discussed. The additional improvement, due to the albumin solution, although not large is nevertheless significant. It may be correlated with the demonstration (see Fig. 1) that the lowering of the blood pressure in normal animals, due to the injection of heterologous albumin solution, is negligible, while a considerable drop is shown when whole heterologous plasma in the same concentration is injected. Apparently this is due to fractions other than the albumin. In view of these results it is very surprising that the difference is not more profound than in actual fact, and would seem

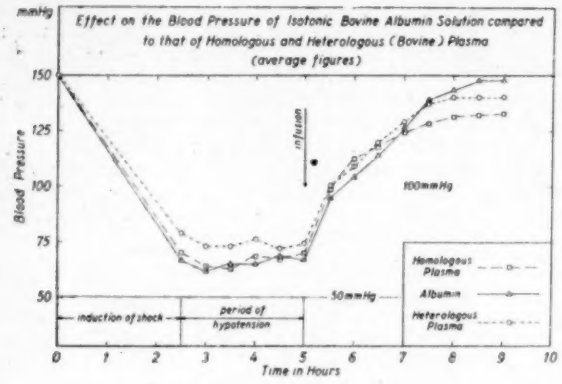


FIG. 2

to indicate that the sharp drop in the blood pressure seen in normal animals after the injection of heterologous plasma is in some way compensated by a state of rising blood pressure, or at least completely minimised when it is injected during a condition of hypotension.

The advantage that the heterologous plasma appears to gain by the lack of visible haemolysis and consequent free haemoglobin is shared to an equal or greater extent by the heterologous albumin, while the latter possesses another advantage in that it also contains no anti-coagulant.

The superiority of albumin solutions over plasma in these investigations is revealed more clearly when it is realised that the saline solution which was used as a solvent for the albumin is probably a far from ideal vehicle, and in all likelihood very inferior to the electrolyte or dialysable portion of normal plasma. An improved response can therefore be expected with the use of a solvent containing optimum quantities of various electrolytes and also (possibly) hormones.

The Use of Heterologous Albumin for Intravenous Injection

Although these investigations were not sufficiently extensive to enable exact evaluation of the possible toxicity of bovine albumin for intravenous injection, we can state, nevertheless, that in more than 50 injections of heterologous (bovine) albumin into animals, not one adverse reaction was noticed. In the shocked animal, the exact effect of the albumin was difficult to gauge on account of the increase of the respiration and the changes in the pulse rate, associated with an improvement of the clinical condition and a re-establishment of the circulation. In normal animals, however, no immediate effect could be observed, either upon the blood pressure and respiration, or upon the heart rate or general behaviour of the recipient. This was so even when repeated injections were made into dogs at intervals of one to three weeks.

The possibility of inducing anaphylactic shock in animals by using pure albumin solutions seems remote. In 12 experiments on rabbits which, after a high sensitising dose of 1 gramme of albumin per kg. bodyweight administered intraperitoneally, were given intravenous "shock" doses of 1 c.c. per kg. b.w. of a 20 per cent. solution at intervals of one, two and three weeks, not only were no symptoms of anaphylaxis noted, but the injections were completely unattended by any untoward symptoms whatsoever, the animals behaving normally and taking an active interest in their surroundings from the time the injections were completed.

This lack of reaction to repeated injection can perhaps be correlated with an apparently complete lack of evidence of the remains of the globulin fraction, as shown by the electrophoretic picture of the albumin used here. As has been indicated before, it was the slow moving component in the electrophoretic pattern that was thought to be responsible for the slightly antigenic properties evident in the preparations of albumin in use some years ago.

The depressor effects elicited by the injection of foreign protein into the blood stream of normal animals are small enough in the case of albumin to be regarded as negligible. The trials which were conducted to demonstrate this phenomenon have indicated that when albumin solution is injected into the blood stream of the normal anaesthetised animal (Fig. 1) there was a slight rise in the blood pressure, followed by a drop of some 10 mm. of mercury commencing about one hour after injection. The blood pressure returns to its former level in one hour. Further injections could elicit no further depressions of the blood pressure.

The profound reduction in the blood pressure of the normal animal initiated by an injection of heterologous plasma (some 30 to 40 mm. Hg) is not corrected so speedily, and the fact that it takes place with maximum effect after a tolerance has been gained to albumin (see Fig. 1) would indicate that the larger depression may be ascribed solely to the globulin fraction of the plasma. In spite of the fact that a slight change in the blood pressure could be detected in the normal anaesthetised animal subsequent to the injection of albumin solution, no change was obvious in the pulse rate or in the rate and depth of respirations. In unanaesthetised animals (namely, 24 injections in rabbits and four in dogs) careful observation failed to detect any change in the pulse rate and the respirations, nor in the behaviour of the subjects, subsequent to intravenous injection. These results bear greater weight when it is realised that about half of these injections were "shock" doses, *i.e.*, intravenous injection after a preliminary "sensitising" dose a week or more earlier. Careful observation of these animals over a period of several months showed no departure from good health.

These resuits would indicate that even repeated injections of relatively large amounts of albumin solution may be carried out both without fear of engendering anaphylactoid reactions as well as without endangering the subsequent health of the patient.

The Use of Heterologous Albumin Solution in Hypotension and Shock

As already indicated, the use of heterologous albumin solution in the therapy of lowered blood pressure and shock due to a depleted circulatory plasma volume resulting from the detrimental consequences of surgical procedure, compared favourably with treatment with either homologous or heterologous plasma. In all cases, its injection was attended by a rapid rise of blood pressure to—or in some cases, slightly exceeding—the normal. This was accompanied by a clinical improvement in the condition of the animal and by an amelioration and gradual disappearance of the symptoms of shock.

The basic investigations with bovine albumin were made with the isotonic solution. The comparison of this with plasma is shown in Fig. 2. The individual effects on each of six cases are depicted in a similar way in Fig. 3. There it will be seen that its effect on the various types of post-

operative shock is predominantly similar. It tends to vary more in relation to the degree of shock that is being treated, and the depth to which the blood pressure had fallen, than to the different factors that may have primarily induced the shock. In all cases the blood pressure will be seen to have returned to normal in a period of some five hours or sooner after the commencement of therapy.

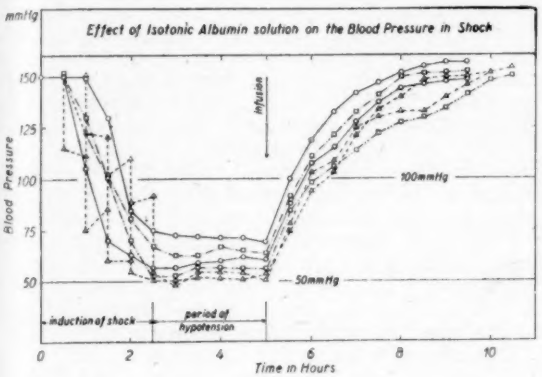


FIG. 3.

The maximal dose administered was the equivalent of 20 c.c. of plasma per kg. b.w. or 1 gramme of albumin dissolved in 20 c.c. normal saline solution per kg. b.w. In most cases where the albumin solution was given in the form of intermittent injections, the clinical improvement was such that only a part of this dose was sufficient to ensure the survival of the animal. Large doses were only needed in those investigations involving cases suffering from trauma, where the loss of plasma from the blood stream does not cease with the restoration of the original blood pressure and the alleviation of shock. In those cases the injections were continued until the full dose had been administered.

This fact raises the point that the length of time that therapy should be continued depends, within limits, less upon the degree of shock present, than upon the possibility or otherwise of eliminating completely the cause of the state of shock. Thus in cases of simple haemorrhage, haemostasis will prevent the further loss of circulatory fluid and induction of shock, and the restoration of only a small part of the missing colloid will usually result in a rapid return to normal. This also applies largely to haemorrhagic shock. In cases where tissues have been traumatised, however, little can be done except supply the plasma proteins as fast as they are lost until the body is able to effect regeneration of the damaged blood vessels in the injured part.

Conclusions

As judged only by the blood pressure and by the survival of the treated animals, as well as by the number of intermittent injections needed to effect recovery, there seems to be no indication that heterologous albumin is eliminated from the circulation faster than the constituents of normal homologous plasma. The absence of either haemolysis or anti-coagulant in the former seems to give it certain advantages that enable it to raise the blood pressure more speedily and to a higher level and to tend to speedier recovery, than does the plasma prepared from the blood of the animal's own species.

This result might not have been entirely unexpected if the homologous albumin fraction had been used; it is, however, surprising in view of the fact that the comparison was made between homologous plasma and heterologous albumin.

In these investigations isotonic bovine albumin was efficacious adequately and expediently to induce a return of the normal circulation and blood pressure in a high proportion of dogs suffering from hypotension and shock, and in alleviating the accompanying symptoms. In all these respects, including the effect on the survival rate, it proved to be at least as beneficial as homologous plasma.

We may conclude, therefore, that the use of homologous plasma for the treatment of shock in the dog can be adequately replaced by the use of isotonic heterologous (bovine) albumin solution.

References

ARMSTRONG, S. H., Jun. (1947). *Amer. J. Med.* **3.** 390.

COHN, E. J. (1941). *Chem. Rev.* **28.** 412.

——, MCMEEKAN, T. L., ONCLEY, J. L., NEWELL, J. M., & HUGHES, W. L. (1939–40). *J. Amer. Chem. Soc.* **62.** II, 2884–3393.

——, ONCLEY, J. L., STRONG, L. E., ARMSTRONG, S. H., FERRY, R. M., & HUGHES, W. L., Jun. (1942). "Properties and Fractions of the Purified Proteins of Animal and Human Plasmas" from Mudd and Thalhimer "Blood and Blood Transfusions," Thomas, Ch. Springfield, Chap. 20, 1942.

——, ——, ——, HUGHES, W. L., & ARMSTRONG, S. H. (1944). *J. Clin. Invest.* **23.** 417.

COURNAND, A., NOBLE, R. P., BREED, E. S., LAUSON, H. D., BALDWIN, E. DE F., PINCHET, G. B., & RICHARDS, D. W., Jun. (1944). *Ibid.* **23.** 491.

ECKHARDT, R. D., LEWIS, J. H., MURPHY, T. L., BATCHELOR, W. H., & DAVIDSON, C. S. (1948). *Ibid.* **27.** 119.

ENTOPOL, W., GLAUBACH, S., GOLDMAN, L. M., & KATZIN, E. (1943). *Proc. Soc. Exp. Biol.* **53.** 125.

FALOON, W. W., ECKHARDT, R. D., MURPHY, T. L., COOPER, A. M., & DAVIDSON, C. S. (1949). *J. Clin. Invest.* **28.** 583.

HARTHOORN, A. M. (1952). *Vet. Rec.* **64.** (In press.)

JANEWAY, C. A., GIBSON, S. T., WOODRUFF, C. M., HEYL, I. T., BAILEY, O. T., & NEWHOUSAN, L. R. (1944). *J. Clin. Invest.* **23.** 465.

KUNKEL, H. G., LABBY, D. H., AHRENS, E. H., Jun., SHANK, R. E., & HOOGLAND, C. C. (1948). *Ibid.* **27.** 305.

LUETSCHER, J. A., Jun., HALL, A. D., & KREMER, V. L. (1949). *Ibid.* **28.** 700.

ORDMAN, C. W., JENNINGS, C. G., Jun., & JANEWAY, C. A. (1944). *Ibid.* **23.** 541.

PARRY, H. B., & LARIN, H. M. Paper presented to the 69th Annual Congress, N.V.M.A.

PATEK, A. J., Jun., MANKIN, H., COLCHER, H., LOWELL, A., & EARLE, D. P., Jun. (1948). *J. Clin. Invest.* **27.** 135.

POPPER, H., VOLK, B. U., MEYER, K. A., KOZOL, D. D., & STEIGMAN, F. (1945). *Arch. Surg.* **50.** 34.

Report of the Council of Pharmacy and Chemistry. (1948). Homologous Serum Jaundice. *J. Amer. Med. Ass.* **136.** 251.

(To be concluded)

QUANTITATIVE INHERITANCE

The papers read at a *colloquium* held at the Institute of Animal Genetics, Edinburgh University, have now been published as a bulletin by the Agricultural Research Council (H.M.S.O., price £1).

A group of geneticists were invited to Edinburgh in April, 1950, to discuss the theory of the inheritance of quantitative characters. This theory has been built up through the application of modern statistical ideas, by Fisher, Wright, Haldane, Hogben, Mather, Lush and others. In particular, the purposes of the *colloquium* were the presentation of more data, the discussion of the validity of the basic biological assumption on which the statistical theory is based, and the attempt to decide what new theoretical developments are most urgently required.

The papers, which have been printed in the order in which they were presented, include a theoretical discussion by Professor Sewall Wright, of Chicago, an important debate between Professor Mather and Dr. Woolf and descriptions of several extensive experiments by members of the Agricultural Research Council's staff at the Institute of Animal Genetics, Edinburgh.

CLINICAL COMMUNICATIONS

BY

P. L. SHANKS, B.Sc., M.R.C.V.S.,
North of Scotland College of Agriculture

(1) BIG LIVER DISEASE IN PIGS

The title of this communication describes the main *post-mortem* finding in a disease which appears to be not uncommon amongst pigs in the North of Scotland area. The disease has been recognised here for a number of years and in the past has been associated with winter litters reared indoors. This year, however, a number of outbreaks have been seen during the summer and one of these occurred in pigs being reared in arks where there was constant access to soil.

The condition is seen first when the pigs are between three to five weeks old and always in pigs which are thriving very well. Often the first indication of trouble is the sudden death of a very good young pig. Examination of the remainder of the litter at this time may show several or all of the litter affected with a heart condition evidenced by a mild or pronounced thumping of the heart. Affected pigs are pale and anaemic in the early stage without diarrhoea or any lack of liveliness. The thumping symptom may continue for a few days before collapse and death occurs. Occasionally it happens that an affected pig does not die suddenly but after a few days begins to lose condition ; it becomes apathetic and dull and appetite is lost. Should this happen the pig becomes a runt very quickly with more exaggerated heart action. Within 14 days a pig at first in excellent condition with clean glossy skin but obviously anaemic could be severely emaciated with dirty skin and staring coat. A very few pigs reaching this stage survive and go on to fatten very slowly. From information received it would appear that some pigs are only mildly affected and the thumping action of the heart is not noticed. These can be recognised in the bacon factory by the fact that the liver is abnormally large.

Post-mortem Findings.—In the acute cases, which can often be recognised by the plumpness of the body before it is opened, the striking feature is the size of the liver. Only a few affected livers have been weighed and these have varied from 8 to 13 oz. compared with normals from the same age of pig which have weighed about 4 oz. The colour of the liver has varied from being very pale to dark red, the latter on closer examination being dark red in the centre of the lobules surrounded by a thin layer of light-coloured tissue giving the impression that the liver substance is covered with tiny haemorrhages. The abnormal colour is not a constant feature. The liver is friable and in one case the immediate cause of death was a severe haemorrhage from a rupture of the liver tissue. There is enlargement of both the spleen and kidneys but not so great as that of the liver. Excess abdominal fluid is present and a varying amount of fibrinous threads cover the abdominal contents. Typical changes also occur in the chest, the heart being much enlarged and rounded with no obvious apex. There is an excessive amount of both pericardial and pleural fluid and in all cases anaemia is obvious.

Observations.—In many of its aspects the condition resembles nutritional anaemia but it has occurred on many farms where dosing with iron is a routine practice. It has also occurred in pigs reared out of doors on soil. Dosing affected cases with iron alone has had no beneficial effect. The disease appears sporadically, generally affecting only one or at the most two litters on a farm although in one outbreak upwards of seven litters on one farm were affected and in another five litters. The latter outbreak was the one which occurred in pigs in arks during the summer and in this outbreak only one litter was totally affected, the others losing two or more affected pigs in each while the rest of the litter appeared normal.

In the cases which developed into runt pigs before death occurred enlargement of the liver, spleen, kidneys and heart was noticed ; the amount of fluid in the serous cavities was greater and the fibrin threads more numerous, producing a peritonitis, pleurisy and pericarditis. Pneumonia was only occasionally present. Cultural examination of the various organs in the body has been consistently negative, using a large variety of media, both aerobically and anaerobically.

Treatment.—During the course of the outbreak in which seven litters were affected a variety of treatments was tried in an endeavour to stop the losses, and because histological examination showed a central degeneration of the liver lobules it was decided to test the value of liver extracts combined with iron dosing. This seemed to give a positive response and since then it has been the practice following the occurrence of one case in a litter to treat the remainder. In a few cases where the pigs had reached the stage of losing condition, large and repeated doses of liver extract combined with iron therapy failed to give any success.

* * * * *

(2) CAN MEAL-DUST CAUSE COUGHING IN PIGS?

J. R. M. Innes, in a letter to *The Veterinary Record*, Volume 48, No. 49, page 1473, in reply to a letter in *The Times* dated October 19th, 1936, by H. G. Robinson, Principal of the Midland Agricultural College, clearly demonstrated the fallacy of the general assumption that the dust from dry meal feeding is responsible for the coughing so common in pigs all over the country. In spite of his unassailable argument some practitioners and the majority of farmers still support the theory that dust can set up coughing which leads on to pneumonia. To demonstrate that Innes' theoretical argument could be proved in practice the following experiment was carried out. With the co-operation of Mr. A. Bigger, Manager of the Duthie-Craibstone Experimental Farm, two portable pig houses and a litter of 10 weaned pigs free from coughs were obtained. Five pigs were put into each house, these being separated by a distance of over 5 feet. Concrete slabs were used to floor the outside run, which was completed with wooden sectional rails. One house was bedded with straw while dust from a meal mill was obtained and used for bedding the other house to a depth of 2 inches. Fresh dust was added weekly to maintain a really dusty atmosphere inside the house. The experiment begun in November was continued until all the pigs had gone to the bacon factory. It was repeated with a fresh batch of pigs in the spring so that both summer and winter conditions were covered by the experiment.

Observations

During the course of the experiment the pigs in the "dust litter" inhaled dust almost continually. Their noses and snouts became encrusted with dust and dust surrounded their eyes. Only on very rare occasions was a cough heard and never at any time were there noticed any of the spasms of coughing which are so common in many piggeries. The pigs developed normally and it was interesting to note that the pigs in the " dust litter " reached bacon weight first, due probably to the fact that there was a certain amount of food value in the meal dust eaten by the pigs. As the pigs

went to the bacon factory an opportunity was taken to examine the lungs. Of the 20 pigs' lungs examined only one pair showed any evidence of pneumonia and those were grossly affected. It is more than a coincidence that this pair of lungs was the first to be examined before the routine procedure at the bacon factory was known. In all subsequent cases the pigs were followed from the time of slaughter until the lungs were removed and in every case pneumonia was absent. It is fairly certain that in the first case the lungs from the wrong pig were produced for the examination and if further support is necessary for this assumption it is only necessary to point out that the pig being the first to reach bacon weight was, therefore, the best thriving pig in the group. It is well known that pigs grossly affected with pneumonia lose weight. In addition the pig showed no clinical evidence of pneumonia either by coughing or by abdominal breathing.

There would, therefore, appear to be every justification for assuming that the experiment proved Innes' argument that dust from dry meal feeding although being responsible, probably, for an occasional cough amongst pigs, will not set up spasms of coughing or lead on to pneumonia.

ABSTRACTS

Skin Graft Treatment of Granulating Wounds in Horses*

The authors describe a method of "seed" grafting to expedite the repair of slow healing wounds of the lower part of the limb in horses.

The first part of the technique is to prepare the wound by removing excessive granulation tissue to skin level with a razor and the application of saline pressure packs for 10 to 14 days. By this time a new layer of active spongy granulation tissue suitable for reception of the grafts will have developed. The epithelial graft is obtained, under local anaesthesia, from a shaved area lateral to the anus. A square inch of epidermis is removed with a razor, placed in sterile normal saline and then cut into small grafts roughly 2 to 3 mm. square. Each individual graft is then, by means of sharp-pointed dressing forceps, embedded into the granulation tissue of the wound to a depth of 3 to 5 mm.; they are placed 1 cm. apart until the whole wound is covered. After-treatment consists of maintaining pressure packs over the wound until epithelisation is complete. Evidence that the grafts have "taken" is usually observed within two to four weeks, but in one case this was not observed before seven weeks. The authors found that 80 to 90 per cent. of the "seeds" are embedded without difficulty and that 20 to 25 per cent. survive. It is likely that some of the grafts are squeezed to the surface of the wound by movement of the limb and consequently perish. Seven cases have been treated, with satisfactory results in five. Strict asepsis does not appear to be vital to success and antiseptics which may destroy epidermal cells are to be avoided.

C. F.

* **Treatment of Granulating Wounds in Horses by Means of Skin Grafting.** Woolsey, J. H., & Schaffer, M. H. (1952). *J. Amer. vet. med. Ass.* **121.** 173-176.

Spaying of Heifer Calves Through the Flank*

The author describes his technique, which is especially suitable for use in seven to eight months' old animals in which the layers of the abdominal wall are soft enough to allow easy surgical penetration. The ovaries can be removed by a chain ecraseur or by a new type of ovariotome operated by a screw mechanism at the handle end of the instrument (illustrated). The ovary is caught in a hook which is drawn into a close fitting housing, thereby slowly severing the ovarian ligament.

The abdominal perforation is made on the right side, close behind the last rib, and the various layers of the abdominal wall are incised in the direction of the muscle fibres. The author uses local anaesthesia alone.

J. E.

* **The Spaying of Heifer Calves Through the Flank.** von Schouppé, K. (1952). *Berl. Tierärztl. Wschr.* **9.** 171-172.

* * * * *

E. rhusiopathiae in Experimental Arthritis in Swine*

The lesions of chronic arthritis in pigs, frequently due to *E. rhusiopathiae*, closely resemble those of rheumatoid arthritis in man. Many cases of rheumatoid arthritis are believed to be produced by the action of streptococcal hyaluronidase. Since *E. rhusiopathiae* also produces hyaluronidase, chronic porcine arthritis might be closely related to rheumatoid arthritis in that both are due to hyaluronidase and the experimental disease in pigs might provide a valuable tool for studying rheumatic diseases. With this in mind, the workers sought first to show experimentally that *E. rhusiopathiae* does consistently produce chronic arthritis in pigs. Sixteen just-weaned pigs from two litters were divided into two groups. One received seven weekly injections of *E. rhusiopathiae* given subcutaneously, then intraperitoneally, and finally intravenously. The other received injections of filtrates of cultures at more frequent intervals. The filtrate group remained normal and were killed in the 15th week after the start of the experiment. Seven pigs of the culture group started to show arthritis 9 to 12 weeks after the start of the experiment, the eighth pig of the group having died early in the course of injections. The condition of the most severely affected pig having become progressively worse, it was destroyed seven months after the first injection. The affected joint showed erosion of articular cartilage, inflammation of periarticular tissue and increase of synovial fluid. *E. rhusiopathiae* was not recovered from the joint. The arthritic condition of the other pigs was worst in the fourth and fifth months; improvement commenced and when killed at the ninth month, they were normal. Eosinophil counts were high in some pigs at the height of the disease and sometimes showed a correlation with sedimentation rates.

A. W. G.

* **Experimental Arthritis in Swine following Multiple Injections with *Erysipelothrix rhusiopathiae*.** Usdin, M., Ferguson, L. C., & Birkeland, J. M. (1952). *Amer. J. vet. Res.* **13.** 188-194 (10 refs.).

Weekly Wisdom

"The moment that the state organises, trains, and employs all the members of a profession, we can no longer speak of it as a profession. We can only speak of a body of expert officials. Such officials might, or might not, have high standards of conduct—but those standards would depend on the state of society, not the professional spirit; and any freedom they enjoyed would be on sufferance from those who held power."—"Professional People," by Roy Lewis and Angus Maude (London: Phoenix House Ltd., 18s. net).

REVIEWS

[**Food Hygiene.** By W. Clunie Harvey, M.D., D.P.H., F.R.SAN.I., and Harry Hill, F.R.SAN.I., A.M.I.S.E., Fellow of the Sanitary Inspectors' Association. London: H. K. Lewis & Co., Ltd. 1952. Pp. 511. 35s. net.]

This is a volume which few people engaged in the inspection of food can afford to be without. Although it is written by men who, by virtue of their employment, are outside any branch of the food industry, yet they show a good understanding of the manufacturing processes within the food trade itself. It is true one does not get a detailed account of the hundreds of methods used to prepare the various foods, but the general picture is good, and is often far better than that possessed by the average meat or food inspector who walks into a factory or shop, performs his duties and walks out again, knowing next to nothing of the shop or factory man's problems.

The book contains some 30 chapters dealing with sources and control of foods; manufacturing; food poisoning; meat, fish, poultry and game; milk, butter, cream; cheese; beverages; condiments; confectionery; cereals; fruits; vegetables; preservation, and home hygiene of food; catering, as well as education. An appendix gives some codes of practice, model by-laws, and a report of the Working Party on Catering. There are no illustrations, but the book is packed with information, opinions and suggestions, with a fairly good index.

The authors rightly stress the importance of cleanliness throughout food handling, and particularly the provision of washing facilities in places where food is prepared. It is a regrettable fact that the average workman or woman still remains uneducated in hygiene, but how can one blame the workpeople when this ignorance also affects their employers? In advocating the education of people in hygienic measures the authors stress the importance of the sanitary inspector in that respect; whilst your reviewer does not wish to detract from the useful work done by such officers, he would point out that the qualifications suggested bear a striking resemblance to those of veterinary surgeons holding a State Medicine Diploma: young men who have been found particularly useful, especially in the meat industry.

Ante-mortem inspection receives scant attention in this book, yet how many of the thousands of pigs passing through the dozens of bacon factories up and down the land every year are reported as being affected with contagious disease? What happens in small factories when an animal dies in transit, there is no *post-mortem* room available at the works, and no veterinary surgeons are employed to inspect the animals? Who knows or cares whether the animal has died of foot-and-mouth disease or anthrax? These are questions this book prompts one to ask.

Errors are few. On page 55 we are told that tetanus, braxy and caseous lymphadenitis are notifiable diseases!

The authors' knowledge of bone taint seems very elementary and out of date. *Dermestes lardarius*, the larder or bacon beetle, is not mentioned. Moulds are not always bad. A York ham is not "mature" until it has a slight growth of mould on the muscle surface, nor does one always get a good bacon "cure" by using sterile brine.

We are told that in some cases veterinary surgeons assisted by lay officials are responsible for meat inspection, the former doing the supervising and the latter the gland-cutting, etc. That is not always so, as veterinary surgeons have to start at the rock bottom, too, and they would hardly be likely to make good supervisors unless they had been through the mill themselves.

Much of what is written about food inspection control readily can be endorsed. It seems incredible that while food works having resident inspectors working to Memo. 62 Foods find that the insurance premium for condemnations is much too low to cover the cost of the diseased food seized every day, the majority of small works where the inspection is part-time find this premium more than enough to enable a profit to be made! The Ministry of Food lays down the premium rate, and takes the smaller works as a basis. Thus the large factory people are penalised for having an efficient whole-time inspection.

No mention is made of electric methods of slaughtering poultry.

The codes of practice applicable to retail food trades drawn up by the M.O.H. for Guildford Borough Council and the Guildford Hygienic Food Traders' Guild are good, and on the whole the volume is well worth the 35s. asked for it. The publishers have done their work well.

* * * * *

[**Diseases of Domestic Animals in Australia. Part 3: Tick and Mite Infestations.** H. R. Seddon. (1951.) Commonwealth of Australia Department of Health. Service Publication (Division of Veterinary Hygiene) No. 7. 200 pp. Canberra, A. c. T.]

This, the third in the series of publications dealing with the diseases of domestic animals in Australia, is devoted to the infestations by ticks and mites. Following the procedure adopted in this series, the morphology and identification of the arachnids is omitted as such information is easily accessible from text-books. Generally, too, the symptoms and lesions are described in so far as they serve to illustrate the effects displayed under Australian conditions.

In the introduction the ticks that are not present, and the only tick-conveyed protozoan diseases of domestic animals that are present in Australia, are named. Of the various ticks that do occur in the country, considerable prominence is given to *Boophilus microplus*, the cattle tick, because of the direct and indirect economic losses it causes. There is an interesting and informative account, illustrated by maps, of the introduction and spread of this tick, as well as notes on the diseases it transmits, the effects of infestation, and methods of treatment. The measures for its control and eradication, with particular reference to New South Wales, are given in some detail as no comprehensive account of these has hitherto been published. Other ticks of economic importance discussed are *Haemaphysalis bispinosa*, the bush tick, *Ixodes holocyclus*, the only species producing paralysis in Australia, *Rhipicephalus sanguineus*, the brown dog tick, and *Argas persicus*, the poultry tick which transmits avian spirochaetosis. Brief notes on 11 other species that may attack stock are given.

Most of the mites that infest domestic animals and fowls in many other countries also occur in Australia but with three notable exceptions. The sheep scab mite, *Psoroptes communis ovis*, introduced in 1788 into Australia with the first importation of sheep, was ultimately eradicated despite a re-introduction in 1884. The equine variety of *Sarcoptes scabiei* has never been recorded in Australia and there is no positive evidence of the occurrence of *Psoroptes communis equi* in the country. Succinct notes are given on various sarcoptid mites that do occur with somewhat more extensive information on *Psorergates*, the sheep itch mite. Demodecid, dermanyssid, tarsonemid and trombiculid mites also receive attention. The publication also

(*Concluded at foot of column 1, page 61*).

REPORT

[Department of Agriculture, New Zealand: Annual Report, 1950-51.]

This report, written by the Director, J. F. Filmer, D.V.SC., covers the work of the Animal Research Division of the Department of Agriculture, New Zealand, for the year 1950-51. In this short review only a summary of the considerable amount of information of practical value which the report contains can be given.

The staff of the Animal Research Division, at its three stations, consists of a happy combination of Veterinary Pathologist, Bacteriologist, Parasitologist, Biologist, Biochemist, Toxicologist and Animal Breeding expert, all working together under the co-ordinating and inspiring influence of their director.

Diagnostic Services.—This section of the division dealt with 14,750 individual specimens in 1950, and the following disease conditions were diagnosed in New Zealand for the first time: stiff lamb disease; leptospirosis in sheep and calves, causing red water; *Vibrio foetus*, and an organism of the Rickettsia group—both the cause of abortion in ewes. Scrotal mange caused by *Chorioptes bovis* var *ovis* was found to be widely distributed, although with relatively low incidence. This last condition was associated with poor testicular tone and might be responsible for lowered fertility. Septicaemic pasteurellosis in cattle was diagnosed; so also was Q fever in a goat imported from England.

Research Work

Sheep-breeding Projects.—Flushing studies were continued for the second year, and the results of the two years' work can be summarised as follows: There was an increased lambing percentage in the flushed ewes, due primarily to a high proportion of twins. There was, however, a higher mortality among twin lambs: 14·2 and 14·3 in 1949 and 1950 as compared with a percentage of 6·5 and 8·1 in single lambs. Three weeks was the minimum time necessary to obtain the maximum effect of flushing. A higher percentage of non-flushed ewes conceived to the first heat.

Pre-lambing Nutrition.—The following conclusions are drawn from the results of three years' study of this subject: (*a*) Provided ewes are not starved, the pre-lambing plane of nutrition has very little effect on the birth weight of lambs; (*b*) provided post-lambing nutrition is satisfactory, the effect of pre-lambing nutrition on growth rate of lambs is negligible; (*c*) it would appear that both over-feeding and under-feeding prior to lambing tend to increase the death-rate in lambs; (*d*) the plane of pre-lambing nutrition has quite a significant effect on quantity and quality of wool produced by ewes.

Pregnant ewes grazed on red clover for two months excreted significantly more oestrogens than similar ewes grazed on rye grass—white clover pasture.

Castration methods in relation to fat-lamb quality were studied. There was no significant difference in the fat quality of lambs castrated at three weeks of age by (*a*) rubber ring, (*b*) knife, and (*c*) emasculator. Lambs castrated at birth by the rubber-ring method were lighter and smaller.

Rachitogenic Factor in Green Feeds.—It has been established that there is a rachitogenic factor in green oat plants and that it resides in the fat-soluble fraction. This factor has also been demonstrated in young Italian rye grass and in the green leaves of permanent pasture. A counter factor is the considerable amount of vitamin D contained in the dead leaves of permanent pasture.

Sheep Diseases.—Cases of facial eczema associated with liver damage were particularly noticeable in lambs grazed on short rotation rye grass. This condition was widespread at the time of the rains which followed a very dry spell in February and March. Lambs grazed on *Panicum miliaceum* (millet) developed photosensitisation in from 3 to 17 days. Liver lesions of severe fibrosis and ductile hyperplasia developed in lambs showing severe clinical symptoms.

Field vaccination trials to control blackleg and pulpy kidney disease were conducted and these proved the value of blackleg vaccine as a prophylactic, but left the value of vaccination against pulpy kidney disease undecided.

Dairy Cattle-breeding Projects

Further development took place during the year in commercial artificial insemination. As in previous years, there was a material fall in conception rates with semen stored for 50 to 58 hours, a fall which was not affected by increasing the dose rate or by the addition of penicillin or streptomycin. Identical twin bulls fed at grossly different rates were tested for their fertility level. At two years the weight of the low-plane bulls was only 61 per cent., their testicular volume only 64 per cent., and their sperm production only 58 per cent. of the respective weights of their twin brothers. After a year on the same high plane of nutrition all weights were closely similar in the two groups. Experiments with identical twins have also shown that a full ration of silage does not reduce the fertility of bulls. Another experiment, also using identical twins, demonstrated the high importance of inherited factors in determining the productive capacity of cows, irrespective of environment and treatment. It is estimated that in butter-fat yield heredity plays a 50·6 per cent. part and environment and treatment 43·5 per cent., error and treatment and heredity interacting together accounting for the remaining 5·9 per cent. No matter what the nutritional conditions are, the greatest source of variation in butter-fat yield within a herd will be the inherited capacity of cows to produce.

Steaming-up of cows for 30 days before calving, while it gave an average of 14·4 lb. of butter-fat, was found at current values not to be an economic proposition.

The influence of tropical climate on the performance of temperate zone cattle was also studied. Twin heifers were used and one member of each of eight sets was sent to Fiji at six months of age. Both groups were kept on the same rations and live weight growth to date has not differed greatly. Some individual pair differences are becoming apparent, which may indicate special adaptability of some individuals. Water consumption has been twice as high in the Fiji animals.

[In a study of this kind due attention must be paid to the presence of chronic protozoal and other infections as a factor influencing the growth and productive development of temperate zone cattle in tropical countries.—*Reviewer.*]

In the course of cattle-feeding experiments in New Zealand it has been noted that well-reared heifers are more difficult to settle in calf than their poorly reared mates. Over the last three years it has been found that this tendency is corrected if bodyweight gains are slowed down for one month before matings; thereafter continuing in the usual way.

---

deals with linguatulosis in Australia and with various native and introduced animals such as dingoes, foxes, marsupials, crows, crocodiles, insects, leeches, etc., which may cause harmful effects in stock or act as predators if not as parasites.

Parasitology

Under this heading a description is given of attempts to prove the development of strains of *Trichostrongylus* resistant to phenothiazine. Seven generations of worms were exposed to repeated drenchings but yet no resistance to the drug could be demonstrated. On the other hand, experiments have demonstrated the development of helminth immunity in young lambs. With the use of the complement fixation test described by Stewart, it has been shown that the newborn lamb possesses no antibodies, but within a week of birth the titre rises sharply to a peak and thereafter falls to a low level. Antibodies, demonstrable in the colostrum of the ewe, are transferred to the lamb during suckling.

In sheep-dipping experiments the need for replenishing the solution frequently during dipping was apparent. In a spray dip of 900-gallon capacity concentrations of gammexane could fall 17 to 44 per cent. with the removal of 200 gallons of solution.

A point of interest noted in another section of the report is the spectacular response of foot-rot in pigs to a single intramuscular injection of 600,000 units of procaine penicillin in oil with aluminium stearate.

As a last point to note in a report which contains much more of practical value, mention must be made of loss of milk production in cows grazing over land which had been top-dressed with North African phosphate and superphosphate. The drop in production can amount to 500 to 1,000 lb. of butter-fat or 1,250 to 2,500 gallons of milk in a 100-cow milking herd in the two months following top dressing. With superphosphate top-dressing, the corresponding loss is about one-fifth of the above figures.

Mr. Filmer and his staff are to be congratulated on the completion of a fine year's work of great promise and value to the livestock industry of New Zealand.

W. W. H.

GYPSY RITUAL SLAUGHTER OF HORSES

On Monday of last week, in a lane at Garsington, Oxfordshire, only a short distance from the motor works at Cowley, members of a gypsy tribe observed the Romany ritual of destroying all the possessions of a dead member. A caravan belonging to Mrs. Harriet Bowers, the "mother" of a clan of 400, who had died in hospital in Oxford the previous week, aged 68, was burned, her two horses were killed, and her crockery was smashed. The Romanies believe that this is necessary to prevent the return of the dead person's spirit.

"The ceremonies," states *The Times*, "followed the funeral of Mrs. Bowers at Abingdon, Berkshire, where her eldest daughter is buried. More than 100 gypsies, meeting for the first time for several years, were present at the funeral. They forsook their caravans at Garsington to travel in a fleet of cars and a 32-seater bus with one of their lorries carrying the wreaths.

"Back at the encampment the men of the tribe set about the preparations. All Mrs. Bowers's possessions, including the harness her horses had worn but excepting the crockery she had used, were put inside the caravan and it was liberally sprinkled with paraffin by her youngest son, William Bowers. Then another relative, Sam Isaacs, put a match to it, and in a few seconds the flames were leaping high.

"A short distance away were the two horses, a five-year-old grey mare and a 10-year-old chestnut pony. Members of the family listened impassively while Inspector Maurice Wait, of the Royal Society for the Prevention of Cruelty to Animals, tried to dissuade them from having the horses killed. Finally one of them said the ritual must be observed. A horse-feller paid £20 for the privilege. The horses were led away and dispatched with a humane killer.

"Finally the crockery was smashed and this, with the iron framework of the caravan, was buried."

XVth INTERNATIONAL VETERINARY CONGRESS, STOCKHOLM

The XVth International Veterinary Congress will be held in Sweden during the summer of this year, from August 9th to 15th, 1953.

PROGRAMME

The scientific proceedings will be divided into the following categories:—

Section I.—Bacterial infection and intoxication (including spirochaetosis, rickettsiosis, and mycosis). Virus diseases and bacteriophages. Vaccination, serum therapy, and problems of immunity.

Section II.—Protozoal diseases. Diseases caused by helminths. Diseases caused by arthropods.

Section III.—Poisonings from industrial works. Plant poisonings. Poisonings especially from DDT preparations, other combatants and certain rat killers, etc.

Section IV.—Metabolic physiology. Metabolic disturbances and deficiency diseases. Allergic diseases.

Section V.—Physiology of reproduction and lactation. Artificial insemination (technique). Fertility disturbances in male and female animals. Udder diseases including diagnosis and combating of these.

Section VI.—Hygiene, feeding, and care. Genetics and breeding. Artificial insemination (breeding and organisation).

Section VII.—Diagnosis (roentgenography, electrocardiography, etc.). Chemotherapy. Antibiotics. Anaesthesia and narcosis. Surgery.

Section VIII.—Meat hygiene. Milk hygiene. Control of fish, shell fish and tinned goods. Methods of storing and tinning. Food poisoning. Public health.

Section IX.—International standardisation of serodiagnostic methods and of bacteriological preparations (sera, vaccines, and allergens). Transport and quarantine regulations. International transmission of semen. International co-operation for producing veterinary educational films. International nomenclature of animal diseases.

Various social events are also being planned, including tours to places of interest both during and after the Congress.

Congress Fees

1. *Ordinary Members*:—

(*a*) Official delegates appointed by the government of the country concerned.

(*b*) Veterinarians and others who have a professional interest in the Congress.

2. *Extraordinary Members*:—

(*a*) Veterinary students.

(*b*) Persons belonging to families of Congress members of any of the above-mentioned categories.

3. *Special Members, i.e.*, veterinarians, institutions and others not taking part in the Congress, but wishing to receive the printed Proceedings.

Ordinary members will probably have to pay a fee of about 80 Swedish kronor and extraordinary members 40 Sw. kronor. The fee for special members has not yet been fixed. (The present rate of exchange, which is unlikely to alter very much, is 15½ Sw. kronor to the £).

Travel Arrangements

Thos. Cook & Son, Ltd., have been appointed Official Travel Agents for the journey to and from Stockholm.

They have prepared itineraries and quotations to cover the journey by sea and air and early application should be made to any of their offices to enable them to register requirements.

Enrolment.—Applications should be sent to the Secretary of the British National Committee, 9, Red Lion Square, W.C.1, in time for them to be forwarded to Sweden—if possible before April 1st, 1953.

NOTES AND NEWS

Diary of Events

Jan. 29th.—Meeting of the Western Counties Division, B.V.A., at Exeter (Imperial Hotel), 2 p.m.

Jan. 30th.—Meeting of the Lincolnshire and District Division, B.V.A., at Lincoln (Saracen's Head Hotel), 2.15 p.m.

Feb. 3rd.—Meeting of the Southern Counties Division, B.V.A., at Southampton (Polygon Hotel), 6.30 p.m.

Feb. 6th.—Meeting of the Sussex Division, B.V.A., at Brighton ("The Old Ship Hotel"), 2.45 p.m.

Feb. 6th.—Meeting of the Society for the Study of Animal Breeding, at the Wellcome Research Institute, London, N.W.1, 2.15 p.m.

Feb. 7th.—North of Scotland Division, B.V.A.: Winter Meeting and Annual Dinner at Aberdeen (Marcliffe Hotel, Queen's Terrace), 3 p.m.

Feb. 12th.—Annual Ball of Glasgow University Veterinary Medical Association, to be held at the Rhul, Sauchichall Street, Glasgow, from 8 p.m. to 2 a.m.

Feb. 12th.—Royal (Dick) School of Veterinary Studies Annual Ball, at the Assembly Rooms, George Street, Edinburgh.

Feb. 27th.—Annual Ball of the Veterinary Society, Faculty of Veterinary Science, The University, Liverpool, to be held in the Students' Union from 8.0 p.m. to 2.0 a.m.

March 4th.—Meeting of the Association of Veterinary Teachers and Research Workers (Scottish Regional Group) in the Royal (Dick) School of Veterinary Studies, Edinburgh, 2.30 p.m.

Council and Committee Meetings of the B.V.A.

The following arrangements for the Council and Committee meetings of the B.V.A. in April and July, 1953, have been made by Council B.V.A.:—

April 20th, 21st and 22nd, in Edinburgh.
July 29th, 30th and 31st in London.

R.C.V.S. Council and Committee Meetings

The next series of meetings will be held in London on February 4th, 5th and 6th (Council).

* * * * *

B.V.A. Council Approves Proposed Transference of Headquarters

At a special meeting of the Council of the Association held at the Connaught Rooms, London, W.C.2, on Friday morning last, the momentous decision was taken with unanimity and enthusiasm to approve and to proceed with the measures proposed by the Premises Sub-Committee of the General Purposes and Finance Committee, to acquire the leasehold interest in No. 7, Mansfield Street, W.1, as new Headquarters for the Association, after a tenure of 36, Gordon Square, W.C.1, extending over 15 years.

The position was explained by the President, Mr. A. M. Graham, in the course of his opening remarks, as follows:—

"I think you all know that we have been looking for new premises for some years, because the lease of our present Headquarters in Gordon Square expires in 1956 and we have been unable to continue in that lease, the fact being that London University has bought it. The Premises Committee has taken active steps to remove the threat of our being homeless.

"No. 7, Mansfield Street, whither their enquiries led them (the Premises Sub-Committee), is a fine, terraced house in a good district, lying between Portland Place and Harley Street. The house has spaciousness and dignity—in fact, everything that we should like our Headquarters to possess."

The President proceeded to outline the particulars given in the report of the Premises Sub-Committee, relating to the accommodation provided by the new house and the financial aspects of its acquisition by the Association on a lease of 999 years, and still subject to certain grants of approval by the local authorities. "We do feel," concluded the President, "that when, as we hope, all this goes through, we shall have a permanent Headquarters of which we will be proud."

A full report of these proceedings will be reproduced in the next supplement to *The Veterinary Record*, while in due course we propose to insert an illustrated description of the premises the Association hopes to acquire in the "consultant area" of the West End—a Robert Adam house of historic significance as an architectural feature of the metropolis.

* * * * *

PERSONAL

Ministry's Veterinary Field Officers: Appointments to the Permanent Staff.—The following appointments are announced:—

Mr. J. M. F. Leitch, M.R.C.V.S., stationed at Paisley.

Mr. J. R. Mitchell, M.R.C.V.S., stationed at Llandrindod Wells.

The Ministry's Animal Health Divisional Office for Norfolk has moved to 106, Thorpe Road, Norwich.

* * * * *

Veterinary Surgeon from Israel.—The British Council is arranging a programme for a World Health Organisation Fellow from Israel, Dr. Menschem Sturman, Director of Veterinary Services to the Israeli Ministry of Agriculture. Dr. Sturman, who has worked in Israel since obtaining his doctorate in Berlin in 1929, arrived in the United Kingdom on January 11th to study communicable diseases transmissible from animal to man. He is also interested in the organisation of veterinary public health services and in veterinary education and problems of animal disease.

For the first part of his stay, Dr. Sturman was at the Ministry of Agriculture and Fisheries, visiting the Veterinary Laboratory at Weybridge and meeting veterinary officers. To February 7th he will be in Scotland visiting Edinburgh, the Hannah Dairy Research Institute, Ayr and the University and Rowett Research Institute at Aberdeen. During his last week in Britain, he will see the Cambridge University School of Veterinary Medicine and the National Institute for Research in Dairying and Cattle Breeding Centre at Shinfield. The visit ends on February 15th.

* * * * *

Will.—Mr. Frederick Thomas Trewin, M.R.C.V.S., of Abbotsham Road, Bideford, formerly of Upton Road, Watford, left £25,387 (£25 272 net; duty paid, £2,220).

He left "My Holland and Holland gun" to his nephew, Stanley Trewin, and among other bequests were: £50 to the Watford Branch of the Y.M.C.A.; £50 to the Victoria Veterinary Benevolent Fund; £50 to the vicar and churchwardens of the West Putford Church, North Devon, for the benefit of the church; and £50 to the vicar and churchwardens of Bradworthy Church, North Devon.

* * * * *

THE HARRY STEELE-BODGER MEMORIAL FUND

All donations to this Fund should be sent to:—

S. L. Hignett,
Steele-Bodger Memorial Fund,
B.V.A.,
36, Gordon Square,
London, W.C.1.

Cheques, postal orders, etc., should be made payable to "Steele-Bodger Memorial Fund."

The next list of donations will appear in the issue of *The Veterinary Record* to be published on January 31st.

* * * * *

Mounted police are now a thing of the past in New Zealand, says *The Times*. The last police horse, British Mint—a former racehorse—has been retired from a police station at Auckland.

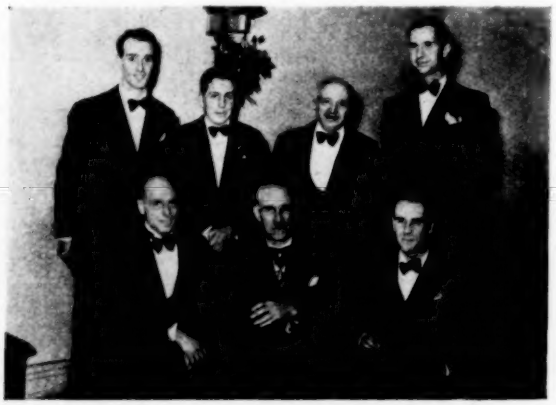
PRESIDENT OF THE ROYAL COLLEGE DINES WITH BRISTOL STUDENTS

Professor J. G. Wright, President of the Royal College of Veterinary Surgeons, was guest of honour at the third annual dinner of the Centaur Society, the student society of the Bristol Veterinary School, on December 3rd, 1952. The dinner, held in the Victoria Rooms at Bristol, was attended by over 100 members and guests. Among those present were Professor Blakemore, Hon. President of the Society, Professor Ottaway and Dr. Bach, Hon. Vice-Presidents of the Society, Professor Hewer and Professor Messervy.

Professor Wright, proposing the health of the Society, outlined the history of veterinary education in this country, and stressed the importance and value of observation at all times. Mentioning by name the graduates of other universities present at the dinner, he said that in future years it was as "Bristol Men" that the members of the Society would be known, and it was upon their shoulders that the veterinary reputation of the University rested.

Replying on behalf of the Society, the Student President, Mr. B. T. Wicks, spoke of the great pleasure that the Society had in welcoming such a distinguished guest as Professor Wright. Although young and still growing, the Centaur Society had tried to play its full part in university life, and endeavoured to maintain a unity among veterinary students in Bristol.

Other speakers were Mr. R. V. Short, Secretary, Professor C. W. Ottaway, Hon. Vice-President, and Mr. J. D. E. Wright, President of the Association of Veterinary Students.



Photograph by courtesy *Western Daily Press and Bristol Mirror.*

Seated, L.-R., Professor F. Blakemore, Professor J. G. Wright, Professor C. W. Ottaway. Standing, L.-R., Mr. B. T. Wicks (President, Centaur Society), Mr. R. V. Short (Secretary), Dr. S. J. Bach and Mr. J. D. E. Wright.

* * * * *

AGRICULTURAL SCHOLARSHIPS

The Ministry of Agriculture and Fisheries invites applications for the following scholarships:—

Ten Senior Scholarships for degree or diploma courses in an agricultural subject (degree courses at University Departments of Agriculture, diploma courses at the agricultural colleges and the Essex and Lancashire Institutes of Agriculture); or for courses in veterinary science at veterinary colleges

Six Extended Junior Scholarships (for those who have already held junior awards), and

Sixty Junior Scholarships tenable at farm institutes for courses not exceeding one year in duration, in agriculture, horticulture, dairying or poultry husbandry.

The scholarships are open to the sons and daughters of agricultural workmen or of working bailiffs, smallholders and other rural workers whose means and method of livelihood are comparable with those of agricultural workmen, and to persons who are themselves *bona fide* workers in agriculture. The value of awards is assessed on a sliding scale according to the circumstances of the parent, or guardian, and the applicant, senior awards being comparable to State scholarships. The usual method of selection is by interview, no written examination being held, but candidates must be able to satisfy the Selection Committee that they will benefit by a course of instruction and that they intend to follow an agricultural pursuit on completion of their training. Candidates must have attained the age of 17 years on September 30th, 1953.

Full information about the scheme and forms of application may be obtained from the Secretary (Room 314), 1, Cambridge Terrace, Regent's Park, London, N.W.1, or from the education offices of county councils. The latest date for submitting completed applications is March 31st, 1953.

* * * * *

LEGAL NOTES

Dog Dragged Behind Tractor.—At East Kerrier Magistrates' Court recently, a farm worker, his son and his son-in-law were charged jointly with causing unnecessary suffering to a dog by causing it to be pulled behind a tractor. All pleaded not guilty.

The R.S.P.C.A.'s case was that the son was seen to tie a dog to the draw-bar of a tractor after the three men left a public house. They moved off at a good speed, dragging the dog behind. Half-way down a hill, the dog, smothered in blood, was seen lying on its side and gasping for breath. There were blood marks on the road for 171 yards. The following day Inspector Norris saw the dog, which was lying with its paws in the air because it could not bear them on the ground. In statements, defendants said the dog was never tied to the tractor but was led on a long cord. At one corner the dog was struck by a car which did not stop. The dog was later examined by a veterinary surgeon who found that the main pads of all its paws had been torn off and the other pads lacerated.

The Bench dismissed the case against the son-in-law without calling on him to speak in his defence. The chairman said it was one of the cruellest cases that had ever come before that court. The other two defendants were each fined £25 and ordered to share equally the costs of £11 8s. Both were disqualified from keeping a dog for two years and the defendant who owned the dog was deprived of ownership. The animal was handed to the R.S.P.C.A.

* * * * *

The Stuffed Two-headed Cat.—In its issue of January 15th *The Times* reports that on the previous day Judge Kingsley Griffith said of an action at Bridlington County Court, to decide the ownership of a stuffed two-headed cat, that the case appeared to him to be an improvement on one that came before him at Hull for the return of a ghost train.

Joseph Woodward, licensee of the Stirling Castle Hotel, Bridlington, sued Cyril Pettit, licensee of the Brunswick Hotel, Bridlington, for the return of the cat, its value—£20—and £20 derived from the hiring out of the cat on exhibition. Woodward, it was stated, had previously been licensee of the Brunswick Hotel and employed Pettit as a barman. Later Pettit took over the hotel and the cat—which was not included in the valuation and inventory—from Woodward.

The Judge said that if Woodward had thought so much of the cat it should have haunted his dreams. Had it been left in the bar it would have served as a warning to those who took too much of his wares against seeing double. "The fact is that he thought nothing of the cat and not as much as anyone would of a cat with one head, let alone two," he said. "He did not worry about it, and, on the evidence, I must conclude that the cat was abandoned when the valuation of the hotel took place and Mr. Pettit took over."

Judgment was given for Mr. Pettit, with costs.

Subsequently Mr. Pettit said that he was going to give the cat to a museum.

* * * * *

ROYAL SANITARY INSTITUTE CONGRESS, 1953

The Royal Sanitary Institute's Health Congress will be held at Hastings from Tuesday, April 28th, to Friday, May 1st, inclusive, under the Presidency of Lord Eustace Percy, P.C. The anticipated attendance of about 2,500 will include representatives of most of the local authorities, government departments, public bodies, universities and kindred learned societies in Great Britain and of many throughout the world.

The President of Section D (Veterinary Hygiene) will be Dr. James McCunn, M.R.C.S., L.R.C.P., M.R.C.V.S., Professor of Veterinary Anatomy in the Royal Veterinary College, and the following papers will be read: "Tuberculin Testing in Relation to the National Dairy Herd," by H. Birkett Allan, M.R.C.V.S., D.V.S.M., Superintending Veterinary Officer, Animal Health Division, Ministry of Agriculture and Fisheries; "The Abattoir Laboratory," by E. F. Lewis, M.R.C.V.S., Senior Lecturer, Department of Medicine (Clinical Pathology), Royal Veterinary College.

ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

ANTHRAX:

Berks.—Palmers Farm, Charlton, Wantage; Cannon Court Farm, Cookham, Maidenhead (Jan. 14th).
Cornwall.—West Towan Farm, St. Austell (Jan. 15th).
Derbys.—Offcote Grange Farm, Ashbourne; Townend Farm, Kirk Ireton, Derby (Jan. 14th).
Devons.—Corks Farm, Uffculme, Cullompton (Jan. 14th).
Essex.—Tewes Farm, Little Sampford, Saffron Waldon (Jan. 13th).
Glos.—Denfurlong Road, Frampton-on-Severn (Jan. 15th).
Kent.—Leacon Farm, Warehorne, Ashford (Jan. 13th).
Norfolk.—Church Farm, Weybourne, Holt (Jan. 12th).
Perths.—Ardgaith Farm, Glendoick, Glencaree, Perth (Jan. 12th).
Stirlings.—Cauldbarns Farm, Stirling (Jan. 12th).
Westmorland.—Calgarth Farm, Windermere (Jan. 15th).
Wilts.—Temple Farm, Corsly, Warminster (Jan. 14th); Lee Court, Donhead St. Andrew, Shaftesbury (Jan. 15th).
Yorks.—Nursery Farm, Station Road, Garforth, Leeds (Jan. 15th).

FOWL PEST:

Bucks.—The Old Vicarage, Ilmer, Aylesbury (Jan. 14th).
Essex.—Hollybeds Farm, Little Baddow, Chelmsford (Jan. 14th).
Glos.—The Garden House, Tortworth, Thornbury, Bristol (Jan. 14th).
Lancs.—Richmond Grove Farm, Forton, Preston; Mount Farm, Mayfield Avenue, Ingot, Preston; Aspden Lane Small Holdings, Oswaldtwistle; Thornlea, Garstang Road, Accrington, Barton, Preston; Southland Head Dyke Road, Pilting, Preston; 41, Equitable Street, Milnrow, Rochdale (Jan. 14th); Belvader, Mayfield Avenue, Ingol, Preston (Jan. 15th)
Lincs.—Thistlewood Farm, Sutton St. James, Spalding; Jarvis Gate, Sutton St. James, Spalding (Jan. 15th).
London.—20a, Childeric Road, London, S.E.14; 80, Elliscombe Road, Charlton, London, S.E.7. (Jan. 15th).
Middlesbrough.—2, Macauley Avenue, Bramble Farm, Middlesbrough (Jan. 14th).
Middlesex.—Palm Cottage, Boswell Common Road, Hayes; "Grantham," Marlborough Road, Hampton (Jan. 14th).
Norfolk.—East Moor, Barton Bendish, King's Lynn (Jan. 13th); The Laurels, Forncett St. Peter, Norwich (Jan. 14th).
Notts.—East Lea, Calverton, Nottingham (Jan. 12th).
Oxon.—Church Allotments, Black Bourton, Oxford (Jan. 13th).
Somerset.—Withygrove Farm, Withygrove, East Huntspill, Highbridge (Jan. 13th).
Surrey.—1, Woodland Cottages, Kingswood, Egham (Jan. 14th).
Sussex.—540, Falmer Road, Woodingdean, Brighton (Jan. 14th).
Wilts.—Lower Farm, Rowde, Devizes (Jan. 13th).
Yorks.—10, Castlegate, Gragg Vale, Mytholmroyd (Jan. 14th).

SWINE FEVER:

Denbighs.—New Houses, Higher Lane, Rossett, Wrexham (Jan. 14th).
Essex.—Bleasend Farm, Sanatorium Lane, Harold Wood, Romford (Jan. 13th).
Lincs.—Exchange Club Yard, Church Street, Grimsby (Jan. 15th); Springfield Farm, Kirton Lindsey, Gainsborough (Jan. 16th).
Salop.—The Oaks, Whixall, Whitchurch (Jan. 14th); Royals Green Farm, Burleydam, Whitchurch (Jan. 15th).
Surrey.—Frosbury Farm, Gravetts Lane, Guildford (Jan. 12th).
Warwicks.—Kenilworth Road, Balsall Common, Coventry (Jan. 15th); Bishops Farm, Oldberrow, Near Henley in Arden, Birmingham (Jan. 16th).
Worcs.—"Kynance," Shawhurst Lane, Hollywood (Jan. 15th).
Yorks.—Meadow Hall Farm, Rotherham (Jan. 15th); Queen Street West Allotments, Swinton, Mexborough (Jan. 16th).

* * * * *

C. W. Allen, aged 27, a bricklayer, of Maddington Lodge, Shrewton, Wiltshire, was killed on Saturday of last week when the motor-cycle he was riding struck a straying bull near Stonehenge. The bull was also killed in the collision.

ANTHRAX IN SOMERSET

The Ministry of Agriculture have informed Somerset County Council that most of the outbreaks of anthrax in the county during 1952 were associated with the use of artificial feeding-stuffs and that, in two cases, artificial manures might have been the source of infection. It was still essential to import feeding-stuffs and sterilisation would be a complicated and difficult undertaking. The Ministry were concerned about the anthrax situation and were considering additional safeguards.

During the year there were 232 suspected cases in Somerset and 152 carcases were destroyed. Earl Waldegrave told the Council there had been 267 suspected cases. In 175 carcases had been destroyed and 133 had been confirmed as anthrax. Farmers, he said, still failed to realise that they had a statutory obligation to report all suspected animals, not merely sudden deaths.

* * * * *

LIVESTOCK EXPORT GROUP

In its report for the Quarter ended December 31st, 1952, the Livestock Export Group states that consideration has been given to a proposal in regard to the health of attendants accompanying stock shipped abroad whereby, it was suggested, as a precaution against the passing of tuberculous infection to stock, stockmen should be "screened" before engagement. The Committee felt that several difficulties would arise in this respect and that it was a matter that could not be enforced. They feel quite confident that exporters, while paying strict attention to the welfare of stock, do discriminate among the men they employ and, apart from being qualified in the handling of stock, that they are strong, healthy types. Further, they feel sure that, if they do not already do so, exporters will bear this point in mind when engaging stock attendants in the future.

The Ministry of Agriculture have advised the Group that they have requested the Ministry of Works to commence the necessary constructional work for the enlargement of the Glasgow Quarantine Station as soon as possible. When this has been completed, 120 head of cattle can be accommodated. It is anticipated the Station will commence operating on this scale some time in April/May; at present, approximately 66 head of cattle can be dealt with.

Although Australia has lifted her ban on the importation of cattle and goats from Great Britain, the import of pigs is still prohibited, as is the importation of cattle from the Channel Isles. No advice has yet been received as to when Canada is likely to raise her embargo on imports of stock from England and Scotland. It has, nevertheless, been notified by the Canadian Authorities that, when the embargo is lifted, *all* animals, in future, will have to pass through quarantine before shipment. Canada has, however, allowed the entry of Scottish animals via Northern Ireland. The regulations stipulate that they must be shipped to Northern Ireland (though without requiring quarantine in Glasgow beforehand) where they are required to undergo quarantine for 60 days before final shipment to Canada. After arrival in Canada, animals must undergo a further period of 30 days' quarantine before despatch to farms. The Maltese Authorities have notified the Ministry that they propose lifting their embargo on cattle from Great Britain and, at the same time, announce that stock will require to be quarantined for 14 days before shipment. It has now been officially confirmed to the Group that New Zealand has lifted her restrictions on the importation of cattle and pigs.

Measures to improve the financial position of the Livestock Export Group were adopted at an extraordinary general meeting of members held in London on Monday last. Mr. A. E. Baldwin, M.P., the Chairman, described effects of last year's foot-and-mouth disease epidemic on incomes derived by the group from levies on cattle exporters, and said that, although income at the end of the financial year was now likely to equal expenditure, there was need for more adequate provision.

The meeting resolved to increase levies for animals exported to 15s. a head for cattle and 3s. a head for sheep, pigs and ponies; to increase subscriptions of exporter and shipper members (excluding one acting solely as a shipping and forwarding agent) to £10 10s.; and to charge fees of 10s. for cattle and 5s. for other animals registered by the group for export to certain countries overseas.

* * * * *

NAPT announces the publication at one guinea, of the Transactions of the Third Commonwealth Health and Tuberculosis Conference, July, 1952, containing a complete verbatim account of the proceedings. The volume has 443 pages and is illustrated by photographs taken during the Conference.

RESOURCES IN RURAL LIFE AT HOME AND OVERSEAS

At a conference held at High Leigh, Hoddesdon, from January 6th to 9th, 1953, under the Chairmanship of Lord Hemingford, "Resources in Rural Life at Home and Overseas" were considered both in their material and spiritual aspect. Mr. J. Macdonald, C.B.E., Director of Research and Education, Forestry Commission, spoke of types of forest, their use for fuel, building materials, weapons, food and industry, and their effect on localities, on agriculture, and on people. Dr. C. F. Hickling C.M.G., SC.D., Fisheries Adviser to the Secretary of State for the Colonies, dealt with the development of the fishing industry out of subsistence fishing, methods and organisation, and the making and upkeep of fishponds. Dr. F. R. Irvine, Friends' International Centre, brought to the notice of the conference the acres of land that are not under cultivation, the possibility of increasing yields, of making use of famine foods, and the natural products of the sea. On the final day of the conference Dr. John Walter, Eastern Area Officer of the Rural Industries Bureau, gave a survey of rural crafts and their importance and necessity, both in industry and in their effect on village life, and Canon M. A. C. Warren, D.D., General Secretary of the Church Missionary Society, spoke on the "Human and Superhuman Resources of the World."

* * * * *

RESTRICTION OF DOG SHOWS

From the current issue of the *Kennel Gazette* we learn that the Committee of the Kennel Club has recently considered the advisability of reducing the number of shows by (*a*) placing further restriction on the number which can be held by existing societies and (*b*) placing a restriction on the number which can be held by newly registered societies. The Shows Regulation Committee examined the present position and decided that they did not wish to suggest any alteration in the system of control. The following recommendations from the Shows Regulation Committee were approved by the General Committee:—

(1) That the maximum number of shows that can be held by existing societies shall remain at four in the year. (2) That newly registered societies shall be restricted to two shows in a year for a period of three years from the date of registration.

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

THE INFLUENCE OF NUTRITION ON REPRODUCTIVE EFFICIENCY IN CATTLE

Sir,—Messrs. S. L. Hignett and P. G. Hignett are to be complimented on the interesting paper which appeared in this journal (10.1.53) and on their reassessment of the data from their wide investigation into the causes of bovine sterility. The hypothesis that the fertility of British dairy cows is materially influenced by their vitamin status now seems inescapable. One uses the word "hypothesis" deliberately here, for actual vitamin D estimations are all too few and, being costly, may very well remain so. It is, however, an axiom of scientific method that the simplest hypothesis capable of fitting a given set of facts should receive preference over more complicated ones. For this reason there seems no present alternative to a correlation between the fertility of dairy cows and their vitamin D status, since the following observations all point in that direction:—

1. Cows in Britain are seasonally responsive to Ca/P imbalance.
2. The response is greatest when, in late winter and early spring, solar activity is low and vitamin D reserves are minimal.
3. Solar radiation in Britain seems likely to be too little to meet the requirements of the larger, highly productive animals for vitamin D production.
4. Reports of the existence of *anti*-vitamin D factors in green fodders, dried grass and hay are becoming more frequent and widespread.

In addition, Allcroft & Folley (1944), in a paper reporting blood alkaline phosphatase values, produced evidence that the means and ranges tended towards a minimum in Dairy Shorthorn cows at about seven months of age. The increases in the older animals could very well reflect increased difficulty in calcium/phosphorus metabolism, involving vitamin D also. Herefords gave both a lower mean value and smaller range, perhaps, though not necessarily, associated with less intensive Ca/P metabolism or more prolonged irradiation.

In connection with item 1 above, it is noteworthy how the finding parallels the older one of Webster (1932) even though the latter was made in New Zealand and related to animals at pasture and not winter-housed. The differences in management and feeding in the two groups of animals must have been so great that only some common and fundamental metabolic change could seem to provide the basis for a similar sensitivity to calcium-phosphorus imbalance, during the spring, both in Britain and in New Zealand.

Without adopting the foolish view that vitamin D is all-important in bovine nutrition, there are reasonable grounds for believing that recent findings relating the vitamin to the fertility of dairy cows may be of quite wide application in this country. The sun shines equally on herds affected by "non-specific" as by "specific" infertility, for the possibility that British farmers feed and manage the two types quite differently seems most remote. Consequently the environmental factors which influence the vitamin D status of the one must affect the other, no matter how much the effect may be masked by "specific" factors. The writer sees no reason to change the opinion, previously expressed, that attention to minor constituents of the ration might well increase the level of productivity by about 5 per cent., which, if it is not a spectacular increase, is not negligible. Moreover, it is impossible even to guess to what extent an improvement in nutrition might influence the incidence of "specific" diseases.—Yours faithfully, JOHN T. ABRAMS, Royal Veterinary College, Royal College Street, London, N.W.1. *January 12th*, 1953.

* * * * *

CLIPPING

Sir,—During the cold, wet weather of 1915-16 at an R.F.A. Training School on Salisbury Plain there were about 700 horses picketed in the open; the horses were unclipped and each horse had two rugs. Mange occurred in the unit and I was instructed by Sir Frederick Smith to discard both rugs, clip the horses all over and treat for mange. There were no deaths from exposure and no respiratory troubles. In May, 1915, a temporary remount depot was formed on Salisbury Plain to equip the 2nd Army. Thousands of horses passed through the depot, which was in the open, and the principal casualties were caused by respiratory diseases. I may add that many of the animals were good young horses direct from the farms and not in hard condition. I can remember as a small boy, well over 70 years ago, looking at heavy draught horses being half clipped.

Horsemastership plays an important part: unless horses are well managed they cannot be kept in condition whether clipped or unclipped, housed or in the open. Moreover, if horses are worked beyond their normal capacity, no matter what diet they receive they will become casualties. Horsemastership had reached such a low ebb in France during 1914-18 that cavalry officers were attached to horse units as advisers in animal management.—Yours faithfully, A. HART, The Anchorage, Ardnadam, Dunoon, Argyll. *January 10th*, 1953.

* * * * *

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth	Fowl Pest	Parasitic Mange	Sheep Scab	Swine Fever
16th to 31st December, 1952	78	—	95	—	—	63
Corresponding period in—						
1951	20	18	28	—	5	41
1950	13	—	39	—	—	54
1949	20	—	8	—	4	—
1st Jan. to 31st December, 1952	1,215	495	498	—	1	891
Corresponding period in—						
1951	407	116	844	—	16	1,343
1950	344	20	172	—	26	430
1949	244	15	582	—	46	5

CORRECTION.—In the statement covering the period December 1st to 15th, 1952, the words "January 1st to December 30th, 1952" in column one should read "January 1st to December 15th, 1952."

Tuberculosis (Attested Herds) Schemes

The number of Attested Herds, *i.e.*, herds officially certified as free from Tuberculosis as at December 31st, 1952, was as follows:—

England	Wales	Scotland	Total (Great Britain)
46,878	26,269	23,282	96,429